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ABSTRACT

This document contains a three-hour course on labor force and training considerations in the construction industry, especially as they relate to the pipe trades. The course is divided into eight major sections that cover the following topics: demographics; technological changes; the nation's labor force in general; the construction industry; training of skilled construction workers; supply and demand considerations and computations; labor force data bank and networking; and a discussion guide and work sheets. Each section contains information sheets discussing projections of personnel and economic trends, training methods, and technological forecasts for the future needs of the construction and piping trades. (KC)

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FACTORS IMPACTING THE CONSTRUCTION INDUSTRY -- AND THE PIPE TRADES IN PARTICULAR

Prepared for the United Association Seminar
of May 16-19, 1988

MANPOWER REPORT 88-3
10 May 1988

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FACTORS HAVING AN IMPACT ON CONSTRUCTION IN GENERAL AND THE PIPING INDUSTRY IN PARTICULAR

MANPOWER AND TRAINING CONSIDERATIONS *

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INTRODUCTION

This three-hour course is divided into eight (8) major sections as follows:

I. Demographics: Population changes -- by State to the year 2000; trends in aging, ethnic groups and high-school graduates; Socio-economic characteristics, including numbers of households, size of families, marriages/divorces, and per-capita income (by State). (*See pages 1 through 7.*)

II. Technological Changes: Advancing science is changing lifestyles, business, industry, education, homes, workplaces ...: includes brief discussions of advanced materials, agricultural genetics, artificial intelligence, biotechnology, control systems, energy development, information processing, manufacturing technology, medical technology, microelectronics, optical technology, telecommunications, and the overall impact; also, information about the factors having an impact on planning and operations; ends with the need to harness research and technology in the construction industry ... and some management reluctance to do so. (*See pages 8 thru 13.*)

III. The Nation's Labor Force, General: Labor pool of younger workers declining in both numbers and quality while jobs require more knowledge and skills; growing mismatch between qualifications of workers needed by employers, and the qualifications of both job seekers and some current employees; Black workers' percent change of the labor force is increasing; business is moving into education and training more by necessity; the relationships between future jobs and knowledge and skills. (*See Pages 14 through 18.*)

IV. The Construction Industry: The Construction Industry in 1988 and long-term prospects; current and projected dollar output by type of construction; projected employment trends by relevant occupations (including plumbers and pipefitters), by type of construction and age distribution of workers by race and gender. ... This section ends with some notes on the fragmentation of the construction industry resulting in comparative inefficiencies. (*See pages 19 through 31.*)

V. Training of Skilled Construction Workers: Training and manpower issues, types of training (e.g., range from individual OJT experience through formal apprentice/journeyman programs); employment equations; "wheels of training" and U.A. concept; open-shop and union frameworks; "competency-based" job training, vs. "time-based" training programs; special "task-oriented" training and career training.... (*See pages 32 through 40.*)

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* *The "Economic Considerations" are presented in a complementary three-hour course.*

VI. Supply and Demand Considerations and Computations: (Macro and pipe-trades specific.) Includes numbers of current workers and projections to the year 2000; computes national annual growth needs for plumbers and pipefitters (to meet expanding numbers of workers needed), as well as annual replacement needs (to make up for losses due to attrition, death and retirement); contains a separate page of key manpower and training highlights of the United Association; addresses unique situation as U.A. plumbers and pipefitters are employed largely in certain types of construction which have different projected growth rates than construction in industry-at-large, and computes annual growth and replacement needs pertinent to U.A. members. (See pages 41 through 48.)

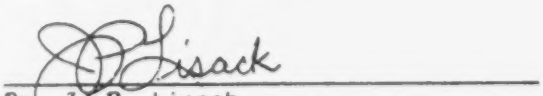
NOTE: ***Essentially, owners have three goals: (1) The most economical (not necessarily the cheapest) cost, (2) meeting specified quality standards, and (3) completion on schedule. The contractors' goals obviously parallel these but also include the desire to make a profit, to reduce liability exposure and to satisfy long-term needs (e.g., survival, growth, greater market share, and prestige); to the extent that the U.A. can help to meet these two sets of goals effectively, as well as meet its own goals, will its future be assured.***

J. P. Lisack

VII. Manpower Data Bank and Networking:

- Employers and owners are concerned about costs and availability of labor, quantitatively and qualitatively -- present and future;
- Unions and skilled workers are concerned about full employment (a decent job at decent pay in a decent environment) -- present and future
- Needed: a data bank and a responsive system which involves and meets current and future concerns of all parties. U.A. members have some distinct advantages in this regard -- (e.g., "pools" of trained and experienced personnel -- and an effective training structure and international organization). (See *Discussion Guide and Worksheet #4 on page 52.*)

VIII. Discussion Guide and Worksheets (See page 49 through 52.): These are to be used to facilitate sharing, note-taking and some goal setting. The course culminates in a "wrap-up" session using these guides. Hopefully, all participants will use these in the future, so these three hours together will have a pay-off.



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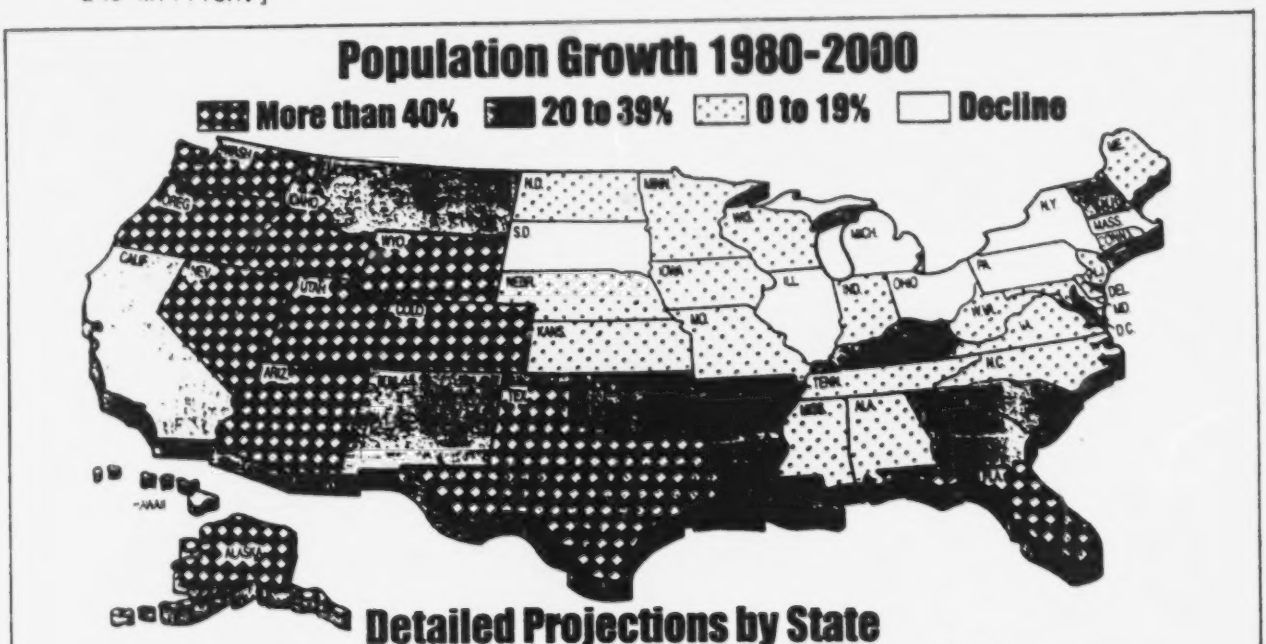
I. POPULATION CHARACTERISTICS AND TRENDS

POPULATION COUNT AND COMPOSITION TRENDS

Between 1980 and 1985, the U.S. population grew 5.4 percent, from almost 227 million persons to 239 million, according to the Census Bureau. This growth has been regionally localized, with only 18 states experiencing greater than average growth. Primary growth has been in the southwest, the southeast, and the west, with this growth expected to continue to the year 2000. Selected metropolitan areas are also expected to continue experiencing growth, such as in Boston and New York City. Five states (plus D.C.) have experienced population loss. The greatest reduction or least increase in population has occurred in previously heavily agricultural or industrial states, such as the Great Lakes or Plains states. [As of January 1, 1988, the total U.S. population had grown to 245 million.]



Detailed Projections by State

	Population in 2000	Change From 1980	1980 Rank	2000 Rank
Alabama	4,415,300	Up 13.5%	22	24
Alaska	630,700	Up 57.5%	50	49
Arizona	5,582,500	Up 105.4%	29	15
Arkansas	2,835,400	Up 24.1%	33	32
California	30,613,100	Up 29.3%	1	1
Colorado	4,656,600	Up 61.2%	28	21
Connecticut	3,062,400	Down 1.5%	25	29
Delaware	638,200	Up 7.2%	47	48
Dist. of Columbia	376,500	Down 41.0%	--	--
Florida	17,438,000	Up 79.0%	7	3
Georgia	6,708,200	Up 22.8%	13	11
Hawaii	1,277,700	Up 32.4%	39	42
Idaho	1,512,200	Up 60.2%	41	39
Illinois	11,187,500	Down 2.0%	5	6
Indiana	5,679,200	Up 3.4%	12	14
Iowa	2,972,100	Up 2.0%	27	30
Kansas	2,494,400	Up 5.6%	32	34
Kentucky	4,399,900	Up 20.2%	23	25
Louisiana	5,159,800	Up 22.7%	19	19
Maine	1,308,000	Up 16.3%	38	41
Maryland	4,581,900	Up 8.7%	18	22
Massachusetts	5,490,400	Down 4.3%	11	16
Michigan	9,207,600	Down 0.5%	8	8
Minnesota	4,489,400	Up 10.1%	21	23
Mississippi	2,939,200	Up 16.6%	31	31
Missouri	5,080,000	Up 3.4%	15	20

	Population in 2000	Change From 1980	1980 Rank	2000 Rank
Montana	963,000	Up 22.4%	44	44
Nebraska	1,661,900	Up 5.9%	35	38
Nevada	1,918,800	Up 140.1%	43	36
New Hampshire	1,363,500	Up 48.1%	42	40
New Jersey	7,427,600	Up 0.9%	9	9
New Mexico	1,727,300	Up 32.9%	37	37
New York	14,990,200	Down 14.6%	2	4
North Carolina	6,867,800	Up 16.9%	10	10
North Dakota	682,000	Up 4.5%	46	47
Ohio	10,356,800	Down 4.1%	6	7
Oklahoma	3,944,500	Up 30.4%	26	27
Oregon	4,025,300	Up 52.9%	30	26
Pennsylvania	11,207,600	Down 5.6%	4	5
Rhode Island	925,800	Down 2.3%	40	45
South Carolina	3,907,100	Up 25.3%	24	28
South Dakota	687,600	Down 0.4%	45	46
Tennessee	5,419,600	Up 18.1%	17	17
Texas	20,739,400	Up 45.8%	3	2
Utah	2,777,400	Up 90.1%	36	33
Vermont	625,000	Up 22.2%	48	50
Virginia	6,389,400	Up 19.5%	14	12
Washington	5,832,500	Up 41.2%	20	13
West Virginia	2,067,700	Up 6.1%	34	35
Wisconsin	5,215,500	Up 10.8%	16	18
Wyoming	1,002,200	Up 112.9%	49	43
U.S.	**267,461,600**	**Up 18.1%**	--	--

USA&WR—Basic data: U.S. Dept. of Commerce

NEW CENSUS FIGURES

The sun belt's soaring growth

The South and West accounted for 91 percent of America's population growth in the past five years, a new census report finds.

The nation's population grew an estimated 5.4 percent between April, 1980, and July, 1985, reaching 239 million. Population losers in that period: The District of Columbia and five states—Iowa, Michigan, Ohio, Pennsylvania and West Virginia.

	July, 1985, population	5-year change
Alaska	521,000	+ 29.7%
Arizona	3,187,000	+ 17.2%
Nevada	936,000	+ 16.9%
Florida	11,366,000	+ 16.6%
Texas	16,370,000	+ 15.0%
Utah	1,645,000	+ 12.6%
Colorado	3,231,000	+ 11.8%
California	26,365,000	+ 11.4%
New Mexico	1,450,000	+ 11.3%
Georgia	5,976,000	+ 9.4%
Hawaii	1,054,000	+ 9.2%
Oklahoma	3,301,000	+ 9.1%
Wyoming	509,000	+ 8.5%
New Hampshire	998,000	+ 8.4%
South Carolina	3,347,000	+ 7.2%
Virginia	5,706,000	+ 6.7%
Washington	4,409,000	+ 6.7%
Louisiana	4,481,000	+ 6.5%
North Carolina	6,255,000	+ 6.4%
Idaho	1,005,000	+ 6.4%
U.S.	**239,000,000**	**+ 5.4%**
Montana	826,000	+ 5.0%
North Dakota	685,000	+ 4.9%
Delaware	622,000	+ 4.6%
Vermont	535,000	+ 4.6%
Maryland	4,392,000	+ 4.2%
Tennessee	4,762,000	+ 3.7%
Mississippi	2,613,000	+ 3.7%
Kansas	2,450,000	+ 3.7%
Maine	1,164,000	+ 3.5%
Alabama	4,021,000	+ 3.3%
Arkansas	2,359,000	+ 3.2%
Minnesota	4,193,000	+ 2.9%
New Jersey	7,562,000	+ 2.7%
South Dakota	708,000	+ 2.5%
Missouri	5,029,000	+ 2.3%
Nebraska	1,606,000	+ 2.3%
Rhode Island	968,000	+ 2.2%
Connecticut	3,174,000	+ 2.1%
Oregon	2,687,000	+ 2.1%
Kentucky	3,726,000	+ 1.8%
Massachusetts	5,822,000	+ 1.5%
Wisconsin	4,775,000	+ 1.5%
New York	17,783,000	+ 1.3%
Illinois	11,535,000	+ 0.9%
Indiana	5,499,000	+ 0.2%
Pennsylvania	11,853,000	- 0.1%
Ohio	10,744,000	- 0.5%
West Virginia	1,936,000	- 0.7%
Iowa	2,884,000	- 1.0%
Michigan	9,088,000	- 1.9%
Dist. of Columbia	626,000	- 2.0%

U.S.NEWS & WORLD REPORT, Jan. 13, 1986

The most rapid growth in the U.S. population is occurring for ethnic-minority groups, especially Hispanics and Asian Americans. By the year 2000, non-Hispanic Whites may comprise two-thirds of the total U.S. population (down from the 1980 proportion of 80%), and by 2020, only about half the total population. Major reasons for this disparate growth include immigration and higher birth and fertility rates for Minorities (especially Hispanics and Blacks) than for Whites.

The fastest-growing geographic regions are reflecting these ethnic-minority growth rates. In addition, ethnic-minorities have tended to concentrate in inner cities, while Whites have been moving to suburban areas (where job growth is occurring) outside the major cities (which have been losing high-paying jobs).

Between 1980 and 1987, the number of Hispanics increased 30 percent -- from 14.5 million to 18.8 million -- five times the growth rate for the non-Hispanic population. By 2000 to 2010, Hispanics could comprise the largest U.S. ethnic-minority group, with close to double its present size. The fastest-growing segment of the Hispanic community comprises immigrants from Central America, but the largest segment comprises Hispanics of Mexican heritage.

Asian Americans, the fastest-growing ethnic group in 1985, now are the second-fastest-growing group. Still, they comprise the third-largest Minority group and are expected to remain such for some time to come.

The U.S. population in general is also aging. Between 1980 and the year 2000, the median age will increase from 30 years to 35 years. This reflects increasing life expectancy and decreasing birth rates, especially for Whites. For the first time in U.S. history, as of 1983, the number of retirement-age people exceeded the number of teenagers. By the year 2020, there will be two retirement-age persons for each teenager.

Age groups which are expected to increase in population between 1987 and 1993 (ordered by rate of increase) include 45 to 54 year olds, 35 to 44 year olds, 75 year olds and older, 5 to 14 year olds, and 65 to 75 year olds. Therefore, companies benefiting from these population changes should include those that service needs related to families, financing, elementary education, and nursing care.

Aging Trends

Projected changes in the size of these age groups, 1987-1993:

AGE GROUP	% CHANGE
Under 5	+ 0.7%
5-14	+10.9
15-24	- 9.9
25-34	- 2.9
35-44	+17.6
45-54	+24.7
55-64	- 4.8
65-74	+ 6.1
75 and older	+17.1

Source: American Demographics

Although Sun Belt retirement centers have best symbolized the aging populations for decades, the aging phenomena has become noticeable in farm areas, in suburbs, and in new Northern retirement communities. The elderly are moving out of cities into rural areas outside the traditional Sun Belt retirement centers. The region with the highest percentage of the population 65 or over encompasses the north central farm states.

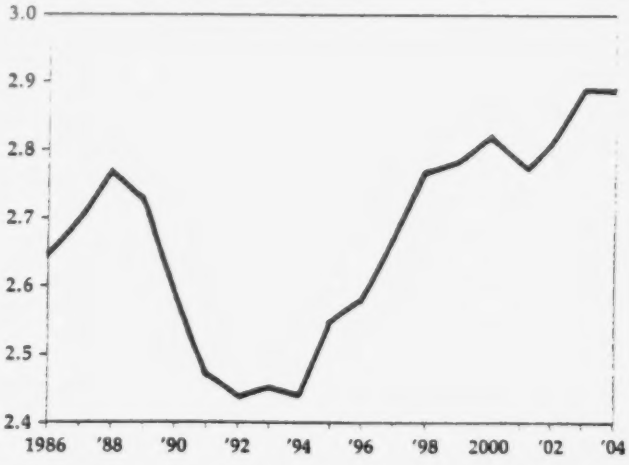
Ethnic diversity is especially reflected within this population age structure -- in particular, among young people and retirement-age groups. A higher proportion of young people and a lower proportion of retirement-age persons are from ethnic-minority groups.

Trends in World Population: According to 1988 world population estimates, the population of North America is expected to increase from the 1988 estimate of 272 million to 296 million by the year 2000. However, the North American share of world population is expected to decrease from 5.3 percent to 4.8 percent. The fastest growth is occurring within Africa (42%: especially Nigeria), Latin America (25%: especially Brazil), and Asia (21%: especially Pakistan, Bangladesh, Indonesia and India), i.e., primarily underdeveloped countries. At the present rate of growth, the world population could double every 40 years.

TRENDS IN HIGH-SCHOOL GRADUATES

Nationally, the 1979 peak of 3 million high-school graduates was followed by steady decreases until a short-term bottom was reached in 1986 (2.65 million graduates). A short, modest upturn since 1986 will culminate with 1988 graduates (2.77 million) and be followed by a rather steep decline of 12 percent until 1992 (with 2.44 million graduates). Major increases are then expected, continuing into the next century to levels exceeding the 1988 peak, with 2.89 million graduates in 2004. Among public high schools, the number of projected public-school graduates in 2004 is expected to be only 4.3 percent below the 1979 historical peak. Private-school projections, however, are much less optimistic.

Projected Number of U.S. High School Graduates, 1986–2004
(in millions)



Source: "High School Graduates: Projections by State, 1986 to 2004," a joint publication of the Western Interstate Commission for Higher Education (WICHE), The College Board, and the Teachers Insurance and Annuity Association. (Available from WICHE, P.O. Drawer P, Boulder, CO 80301-9752; order publication #2A178, $7, prepaid.)

From *Higher Education & National Affairs* 4/11/88 — 3

As with population changes, graduation estimates are expected to vary greatly across regions and states and with respect to ethnic-group composition. **Northeastern** states will continue to experience substantial decreases in numbers of high-school graduates (except for Maryland, New Hampshire, and Vermont which are expected to have more graduates by 2004). This region as a whole will have 5 percent fewer graduates in 2004 than the 1986 bottom. **Northcentral** states will all experience decreases in their graduate counts until 1992, followed by a slow recovery but still having 9 percent fewer graduates in 2004 than in 1986. Only Kansas, Minnesota and Missouri will have graduate numbers that match or slightly exceed their 1986 counts. **South** and **Southcentral** states as a whole will graduate 16 percent more students in 2004 than in 1986, with intermittent changes varying state by state. Of the 14 states, seven will have more graduates in 2004 than in 1986 (led by Florida's projected 60% increase), and seven will have fewer graduates (led by West Virginia's 31% drop). **Western** states will

experience less severe decreases in the early 1990's, with the number of graduates expected to exceed those in the Northeastern and Northcentral states by 2004, graduating 44 percent more students in 2004 than in 1986. There will again be variations among Western states. For example, Alaska and Nevada will double their number of 1986 graduates, while Idaho and Wyoming will be among the states with the greatest declines between 1986 and 2004.

In contrast to overall declines in the number of high-school graduates, the number of graduating high-school Minority students has been increasing, both numerically and proportionately (especially among Blacks). Even so, in 1987, the proportion of Hispanics 25 years old and older with at least a high-school diploma was only 50.9 percent, well below the rates for other ethnic groups, but up markedly from the 45.4 percent of 1982.

PROJECTED CHANGES IN GRADUATES, BY STATE, FROM 1981 TO 2000

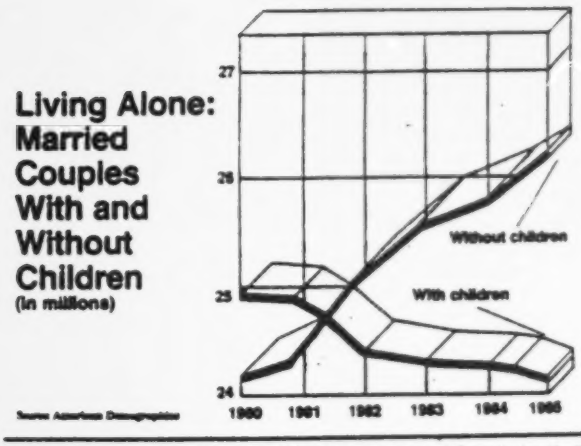
*Projections include graduates of public high schools only. All other state projections include public and nonpublic high-school graduates.

†Projections are for 1998-99.

Source: Western Interstate Commission for Higher Education. From Harold L. Hodgkinson, "Demographics and the Economy: Understanding a Changing Marketplace." The Admissions Strategist, Jan 1985, p.3.

SOCIO-ECONOMIC CHARACTERISTICS

According to the National Center for Health Statistics, fewer couples are marrying -- 18,380 (3.0%) fewer in 1985 than in 1984. However, the decline largely reflects major drops in New York (-23.4%), Michigan (-30.7%), Missouri (-21.5%), Tennessee (-19.3%), Massachusetts (-15.6%), Georgia (-7.4%), Pennsylvania (-7.9%), Illinois (-5.7%), Louisiana (-8.9%), South Carolina (-6.5%), and Iowa (-16.1%). In contrast, major increases in marriages were experienced in Texas (9.9%), Florida (9.9%), Kentucky (31.3%), Arizona (34.9%), New Jersey (14.8%), Virginia (10.0%), and Oregon (22.0%). To some extent, these changes reflect the shifting population. In addition, while fewer couples are marrying, an increasing number and proportion of married couples are choosing to not have children.



Source: "Here They Come, Ready or Not," Executive Week (Special Report), May 14, 1986, Vol. 9 (No. 341), pp. 13-17.

While the number of marriages is declining, the number of households is increasing, but the size per household or family is continuing to decline. After remaining around 3.6 persons until about 1970, the average-family size in the 1970s began dropping and was 3.3 in 1980. It is expected to continue to decline to an average of 3.0 in 1990.

Between 1980 and 1985, the number of households increased by 7,100 or 8.8 percent to 87.5 million (compared to the 5.4% population increase), to a large extent reflecting the changes in the population. Major increases have occurred in California (13.8%), Texas (17.7%), Florida (20.5%), Geogia (14.3%), North Carolina (11.6%), Virginia (10.7%), Arizona (21.0%), Colorado (14.8%), Washington (8.8%), South Carolina (12.1%), Oklahoma (10.6%).

Two reasons for the increasing numbers of households with decreasing marriages are increasing illegitimate births and high divorce rates (although they have leveled off since the late 1970s). The teenager illegitimate-birth rate has increased from 15 percent in 1960 to 54 percent by 1983, and is still increasing. However, although teenage illegitimacy is a growing problem, illegitimacy is a greater problem among adult women. Between 1980 and 1985, the number of illegitimate births increased 24 percent. One out of four U.S. children born is illegitimate. This increasing number of illegitimate births is in the face of decreasing overall birth rates, further exacerbating the illegitimacy problem.

Illegitimacy, while increasing rapidly for all economic groups, is especially prevalent among the poor and disadvantaged -- despite increasing abortion rates. These high

USA households: more, but smaller

The number of households in the USA increased 8.8 percent from 1980 to 1985 while the population increased 5.4 percent, the Census Bureau estimates in a report released today. The study reports 87.5 million households as of July 1, 1985. Population per household fell to 2.69 from 2.76 (Story, 1A). Households in July 1985 (in thousands), increase from 1980 (in thousands), percent of increase and percent change in population:

State	Households — July '85	Households — Increase 1980-85	Households — Percent increase	Change in population
Ala.	1,438	96	7.2%	+3.3%
Alaska	172	41	31.2%	+29.7%
Ariz.	1,158	201	21.0%	+17.2%
Ark.	873	57	7.0%	+3.2%
Calif.	9,820	1,191	13.8%	+11.4%
Colo.	1,218	157	14.8%	+11.8%
Conn.	1,165	71	6.5%	+2.1%
Del.	227	20	9.8%	+4.6%
D.C.	254	1	0.5%	-2.0%
Fla.	4,512	768	20.5%	+16.6%
Ga.	2,140	268	14.3%	+9.4%
Hawaii	330	36	12.3%	+9.2%
Idaho	349	25	7.8%	+6.4%
Ill.	4,202	157	3.9%	+0.9%
Ind.	2,001	74	3.9%	+0.2%
Iowa	1,071	18	1.7%	-1.0%
Kan.	916	43	5.0%	+3.7%
Ky.	1,338	75	5.9%	+1.8%
La.	1,546	134	9.5%	+6.5%
Maine	428	33	8.2%	+3.5%
Md.	1,590	129	8.8%	+4.2%
Mass.	2,150	118	5.8%	+1.5%
Mich.	3,269	74	2.3%	-1.9%
Minn.	1,533	88	6.1%	+2.9%
Miss.	891	64	7.7%	+3.7%
Mo.	1,882	89	5.0%	+2.3%
Mont.	305	21	7.4%	+5.0%
Neb.	594	22	3.9%	+2.3%
Nev.	375	71	23.3%	+16.9%
N.H.	367	43	13.3%	+8.4%
N.J.	2,723	174	6.8%	+2.7%
N.M.	504	63	14.2%	+11.3%
N.Y.	6,657	317	5.0%	+1.3%
N.C.	2,281	237	11.6%	+8.4%
N.D.	242	14	6.3%	+4.9%
Ohio	3,947	114	3.0%	-0.5%
Okla.	1,237	118	10.6%	+9.1%
Ore.	1,035	43	4.3%	+2.1%
Pa.	4,366	146	3.5%	-0.1%
R.I.	360	22	6.4%	+2.2%
S.C.	1,155	125	12.1%	+7.2%
S.D.	253	11	4.5%	+2.5%
Tenn.	1,750	131	8.1%	+3.7%
Texas	5,801	872	17.7%	+15.0%
Utah	506	57	12.8%	+12.6%
Vt.	195	16	9.1%	+4.6%
Va.	2,063	200	10.7%	+8.7%
Wash.	1,677	136	8.8%	+6.7%
W.Va.	707	20	3.0%	-0.7%
Wis.	1,735	83	5.0%	+1.5%
Wyo.	180	14	8.6%	+8.5%
Total	**87,489**	**7,099**	**8.8%**	**+5.4%**

Source: U.S. Department of Commerce

and increasing illegitimacy rates carry grave risks for those involved and for society:

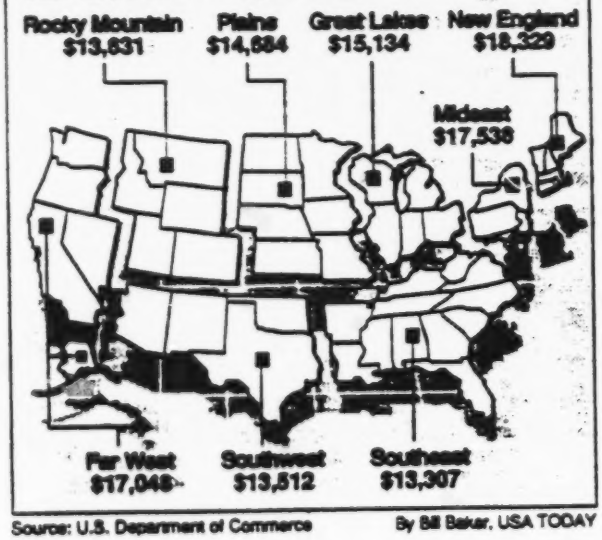
- Increasing need for welfare assistance (now the majority of unwed mothers and children) together with an average dependency period of nine years and the tendency to not participate (at least effectively) in the labor force,
- Much lower average incomes (poverty level) for those mothers who do work,
- Higher rates of child delinquency and educational problems, and
- An overall difficult and disadvantaged upbringing, perpetuating the cycle of problems.

Between 1965 and 1986, the pace of domestic decay has accelerated, especially during the last seven years. It has finally become generally accepted that family breakdown is now the primary force causing poverty in the U.S. That is, the major factor creating poverty in recent years has been the decline of the two-parent family. Over half of all officially poor families are now female-headed -- the families with the largest income shortfalls, the longest stays below the poverty line, and the heaviest demand for public assistance.

Per-capita income increases are slowing due to (a) decreasing earnings in finance, retail trade, services and construction, according to the U. S. Department of Commerce, (b) continuing decline of high-paid manufacturing jobs, and (c) growth in lower-pay service jobs.

Northeast remains on top

The Northeast maintained the highest per capita income, and also scored the largest gains in income. New England incomes went up 6.7 percent between 1986 and 1987 while the Mideast states rose 6 percent. No other regional income gained by more than 4.8 percent. Per capita income:



Source: U.S. Department of Commerce By Bill Baker, USA TODAY

USA TODAY, April 21, 1988, pp.1,6.

Per capita income rises

Per capita income in the USA increased by 4.8 percent between 1986 and 1987. State-by-state breakdown with income, one-year change and USA rank:

State	Per capita income	Change 1986-87	USA rank
Alabama	$11,780	4.0%	44
Alaska	17,868	-0.7%	5
Arizona	14,030	2.9%	29
Arkansas	11,343	2.7%	47
California	17,661	4.7%	7
Colorado	15,862	4.1%	13
Connecticut	20,980	6.9%	1
Delaware	16,238	5.1%	11
D.C.	20,303	6.5%	–
Florida	15,241	4.3%	19
Georgia	14,098	4.7%	27
Hawaii	15,366	5.1%	16
Idaho	11,820	5.3%	43
Illinois	16,347	5.2%	9
Indiana	13,834	5.3%	31
Iowa	14,191	6.1%	26
Kansas	14,952	3.2%	21
Kentucky	11,950	5.4%	41
Louisiana	11,362	1.5%	46
Maine	13,720	7.3%	33
Maryland	17,722	5.1%	6
Massachusetts	18,926	7.2%	3
Michigan	15,330	3.5%	18
Minnesota	15,783	5.3%	14
Mississippi	10,204	5.2%	50
Missouri	14,537	4.4%	24
Montana	12,255	3.5%	40
Nebraska	14,341	4.5%	25
Nevada	15,958	3.8%	12
New Hampshire	17,133	5.0%	8
New Jersey	20,067	6.4%	2
New Mexico	11,673	2.1%	45
New York	18,055	6.5%	4
North Carolina	13,155	5.8%	34
North Dakota	13,061	4.9%	35
Ohio	14,543	4.6%	23
Oklahoma	12,520	1.6%	38
Oregon	13,887	4.2%	30
Pennsylvania	14,997	5.3%	20
Rhode Island	15,355	5.4%	17
South Carolina	11,858	5.2%	42
South Dakota	12,511	5.9%	39
Tennessee	12,738	6.1%	37
Texas	13,764	2.1%	32
Utah	11,246	2.3%	48
Vermont	14,061	5.4%	28
Virginia	16,322	5.6%	10
Washington	15,444	3.1%	15
West Virginia	10,959	4.1%	49
Wisconsin	14,659	4.8%	22
Wyoming	12,759	-0.1%	36
USA	**$16,340**	**4.8%**	–

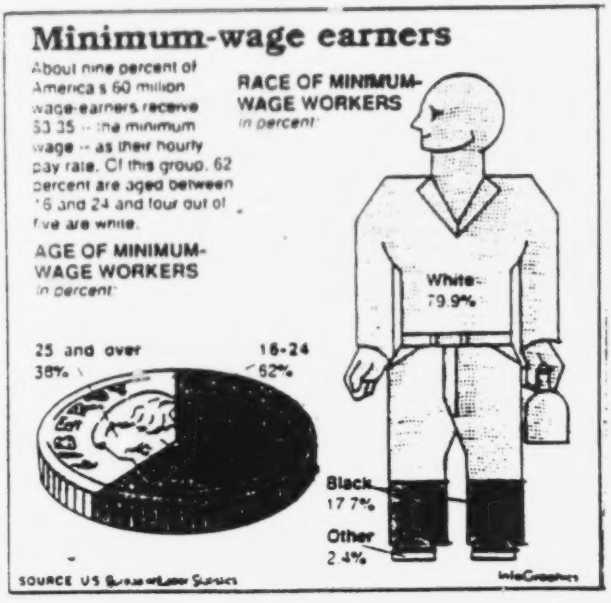
Source: U.S. Department of Commerce

10

Differences in regional income levels are again widening after converging for more than 50 years. Recent estimates by the Bureau of Economic Analysis concerning per-capita income changes between 1979 and 1986 indicate that

- the **Great Lakes** and **Plains** states lagged behind the nation as a whole, increasing 6.4 percent and 6.6 percent, respectively, compared to 7.1 percent nationally. The causes include stagnation in the areas' traditional manufacturing base and low population growth coupled with population out-migration, which reduces consumer demand. [Although agricultural-residence population has continued to decline (to 4.99 million in 1987), more than half (2.53 million) are still located in the Midwest states.]
- Per-capita income in **New England** and the **Middle Atlantic** states pulled ahead of the rest of the country (9% and 8%, respectively) despite slow population growth.
- In the **Southwest** and **Far West**, although total personal income has risen at a rate comparable to that in the Northeast, because the population has been growing twice as fast as the nation in general, per-capita income is rising more slowly.
- **Rocky Mountain** states, beset by problems in agriculture and the oil industry, have experienced below-average gains in both total personal income and per-capita income, even while their population growth rate has exceeded the national growth rate.

From 1986 to 1987, the per-capita income continued to increase but at a slower pace. However, only 13 states had per-capita income **growth** greater than during the previous year -- half in the Southwest and Rocky Mountain States -- because of slowing population growth and pickups in manufacturing.

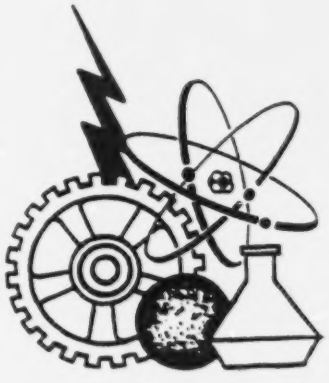


II

EXCERPTS FROM THE TECHNOLOGY OVERVIEW REPORT PRESENTED BY DR. JOHN D. HAGUE, Sc.D. - PRESIDENT AT THE CORPORATION FOR SCIENCE AND TECHNOLOGY COMBINED TARGETED TECHNOLOGY COMMITTEE MEMBERS MEETING

Indianapolis Convention Center

April 24, 1987



In 1987, a group of over 500 scientific, engineering, educational and business experts associated with the Corporation for Science and Technology, located in the State of Indiana, predicted that **"the world is on the verge of a major lifestyle, business, industry and educational upheaval, an upheaval which will be fueled by rapid technological growth and by a very competitive worldwide marketplace. This upheaval brings with it major threats and opportunities to the business and economic base of the United States, including that of the State of Indiana."**

ADVANCED MATERIALS TECHNOLOGY, is generating a great deal of excitement by the development of new materials in the laboratories; materials that have not existed previously...materials in the fields of semiconductors, polymers, ceramics and others.

Major materials-fueled advances are predicted in the fields of powdered metalurgy, in super plastics and adhesives, in polymer, ceramic and metal based composites, in steel surface treatments, superconductive materials, in new metal materials, and in structural ceramics.

In the area of **AGRICULTURAL GENETICS AND TECHNOLOGY**...the headlines center around new genetic manipulation and embryo transplantation in animal agriculture operations; plant genetic modification to provide improved plant characteristics; and integration of computers and artificial intelligence controls into a broad range of agriculturally related operations.

And in **ARTIFICIAL INTELLIGENCE**, the committee forecasts major advances in the use of expert systems, in the development of AI oriented computer architectures, and new AI higher order languages. They see the technology entering the field of natural language driven processing, in image and verbal recognition systems, in the translation from one language to another, vision for robotics, new generations of optical scanners to read and respond to written text, computer aided instruction management and control, automatic programming and debugging of computer software, complex communications systems management and control, and in the development of materials and genetics characteristics prognoses.

In **BIOTECHNOLOGY**, a virtual technological explosion is predicted in which DNA probes, monoclonal antibodies and enzymes have been identified as high growth areas. Major advances in the areas of medical diagnosis and treatment, plant and animal characteristics engineering, and waste management are foreseen. Another major growth area is seen to be biotechnology related manufacturing and quality control systems as this technology begins to "take hold" across a wide range of industries....

In the field of **CONTROL SYSTEMS**, another rapid acceleration scene is predicted as advances in computers, microelectronics, optical systems, and Artificial Intelligence fuel the development of highly capable control systems throughout industry, homes, hospitals, military systems and others.

Many of these systems will be vision capable and will utilize sophisticated sensor systems in real time, iterative feedback process control systems, in order to maintain the high level of control that many of the new processes will require.

In **ENERGY DEVELOPMENT**, advances are foreseen in the areas of new combustion technologies, post combustion treatments, co-generation systems, and in shale oil extraction systems. High efficiency solar voltaic systems are also envisioned.

In the field of **INFORMATION PROCESSING**, the forecasts are for continuing explosive growth, with computing power per dollar continuing to double every four years during the period. New generations of software development will be aided by AI based software generators and evaluators. ... [There will be] simultaneous voice and data handling systems that can place the information that you need where you need it. Strong shifts to parallel processing are predicted. [Workers and] the general public [will be] increasingly involved with computers and computer products.

In **MANUFACTURING TECHNOLOGY**, the committee sees advances in artificial intelligence, electro-optics, information processing and control systems paving the way for major expansions in the applications for manufacturing technology. They see the need for increased automation to maintain the process controls that will be required and to deal with the reduction of product cost. They see integrated design, manufacturing and quality assurance systems geared to support both high and low volume production...and they see interface standards emerging that will facilitate increased competition, lower costs and higher quality manufacturing technology. They see advanced control systems, many with 3-D vision, color and pattern recognition, with sophisticated tactile and force sensors. And they note the need to be able to deal with new materials that are beginning to enter the field.

In **MEDICAL TECHNOLOGY**, advances in biotechnology, in microelectronics, in telecommunications, artificial intelligence, optical technology and others will accelerate the development of sophisticated medical diagnostic, treatment, and management tools. The trend to out-patient treatment and care will accelerate the development of doctor's office and home-based systems for patient care. Less invasive surgical processes will increase, [including] lasers. Significant advances in the monitoring and control of anesthesia procedures are expected, as well as implanted microelectronic circuits to reinstate muscle control and bodily function control.

Biotechnological breakthroughs are expected to allow for improved diagnostics and patient treatment as well as allow the detection of persons who tend to be predisposed to given medical problems, such as high cholesterol and heart disease.

And in **MICROELECTRONICS**, the committee envisions continuing explosive growth as higher densities, higher speeds, higher reliabilities and lower costs continue.

They see the increased use of Application Specific Integrated Circuits (ASIC) by the medium and small sector of industry in order to protect their designs and to remain viable in cost and product capability. They see extremely high densities with an anticipated maximum of 100 million components per chip, with 5 million components per chip in the early 1990s and between 10 and 100 million by the year 2000. The anticipated advances in this technology will cause the microcircuit to permeate virtually every area of endeavor.

And in **OPTICAL TECHNOLOGY**, we have another explosive situation in which optical data transmission through fiber optic systems will mature and spread rapidly and set the stage for a rapid increase in low cost, broad band communications. Optical sensors will provide automation systems with the inputs that they need for monitoring and control...and optical computers will emerge as the solution to many high speed computing needs. Optical data storage technology breakthroughs will usher in a new generation of information storage systems with widespread applications in our factories, homes, schools, offices and retail outlets, and in our communication systems. The optical technologies are so basic to the next generation of products, processes and operations that they deserve attention by virtually every organization, regardless of their present products, processes or functions. The optical technologies will constitute major threats and opportunities for thousands of businesses worldwide.

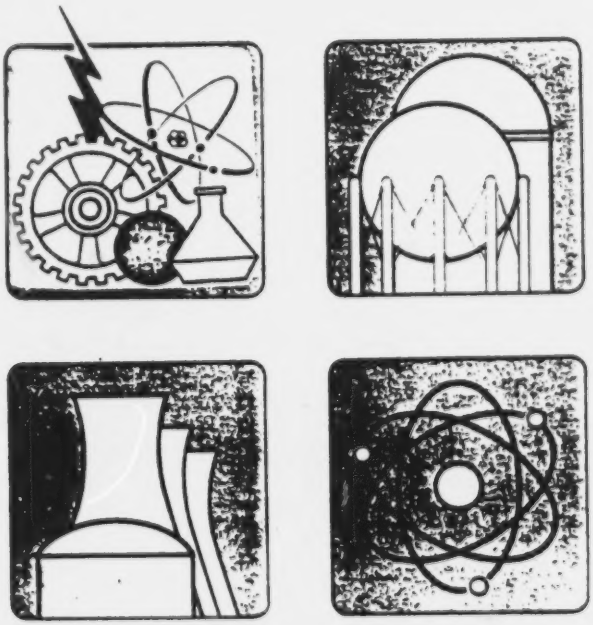
And in the case of **TELECOMMUNICATIONS**, again major changes are foreseen. Single integrated digital network systems are predicted to replace individual stand-alone systems that presently handle phone traffic, data and facsimile traffic and local area network traffic. They see the emergence of a worldwide digital network protocol, paving the way for explosive growth in the digital communications industry. They see major increases in the use of microelectronics and optical technologies in telecommunications systems, both local and long distance. And they stress the probable impacts of this telecommunications network upheaval on all walks of business and industry education, the medical care industries and the home.

OVERALL

The message is clear that very low cost, very reliable microelectronics systems, coupled with low cost, reliable optical-based data transmission and sensor systems and with powerful artificial intelligence or expert systems will bring a new generation of total communication into use. This communication upheaval, coupled with the expected breakthroughs in the other targeted technologies will begin to change the ways we do just about everything in our homes, in our factories, in our hospitals, our doctors offices, transportation systems, in our offices, in our schools, on our farms, [on the construction site,] and virtually everywhere else...and we will have higher levels of worldwide competition than we have every seen before...competition in research, engineering, design, manufacturing, sales, and product support...and many of our present product lines will be decimated by next generation products and services...and there is nothing that we can do to slow down the process or to stop it nor is it sensible for us to try. In fact, our prognosis for change is probably very conservative and the changes will happen more quickly and more deeply than we now anticipate.

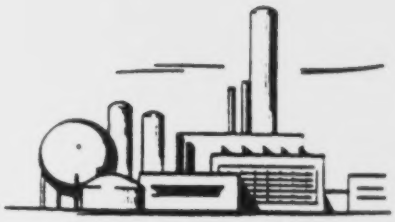
. . . . . .

Dr. Hague concluded with this statement, "Well, that information all went by so rapidly that you probably feel as if you have just taken a drink from a fire hose...."



MODIFY OR PETRIFY

There are significant changes affecting the success or failure of a company, organization, or employment in various industries. Critical reasons affecting companies' futures and employment upheavals include:



(1) Improved productivity and quality due to automation, mechanization, computer integration of whole systems; new processes -- including greater flexibility, extensive use of instrumentation and improved machines and tools, and more sophisticated quality-control inspections and systems.

(2) New materials: e.g., plastics and adhesives of various types made to users' specifications and produced on-time in quantities ordered, and others such as fiber optics and ceramics.

(3) Increased competition, which is occurring as more firms from other nations enter the U.S. and world markets, as well as inter-State and inter-community competition. For example, at a time of excess auto and truck production capacity around the world, Japanese companies are continuing to build production plants in the U.S., which translates into some domestic-plant closings -- and perhaps even a price war. The steel, automotive and electronics industries are still reeling under international competition blows.

(4) Financial considerations: besides the quality and design factors pertaining to each product made, such things as tariffs, and the value of the dollar world-wide, and all costs of production and delivery factors drastically affect employment and the growth or contraction -- indeed the very success or failure -- of a company.

(5) Out-sourcing, which basically involves doing labor-intensive jobs overseas, primarily to reduce labor costs by using 'cheap labor' -- such as in Mexico, Taiwan, Malaysia, or Korea.

(6) (Industrial) transplants exist when one nation builds and operates a plant in another nation (e.g., Japanese firms auto-assembly and parts plants in Illinois, Indiana, Kentucky, Tennessee, Ohio, etc.).

(7) "Just-in-Time" workers, (also called 'contingent workers') because employers can expand or contract their numbers according to business conditions or seasonal cycles;

(8) Inter-company and other inter-organizational arrangements: joint planning, cooperation and operations.

(9) "Reindustrialization": relocating a plant, such as to locations where transportation, infrastructure, markets, workforce considerations, etc. are more favorable.

(10) "Mismatches" between the knowledge and skills needed by employers, and the knowledge and skills of employees or job applicants, as well as the inability of training and organizational structures to plan ahead, and act cohesively to meet future needs.

(11) Factors of planning: becoming much more important are prompt application of appropriate technology, productivity, quality, design, innovation, timeliness, service, customer satisfaction, total costs, direct investment in production near markets, and entrepreneurship.

In Strategic management planning --

The most dangerous status is the status quo.

J. P. LISACK
PROFESSOR OF TECHNOLOGY AND DIRECTOR
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MANAGEMENT'S COLD SHOULDER FOR IMPROVED TECHNOLOGY *

The disinterest of owners, contractors, architect-engineer firms, and so on in university research is all of a piece with their diffidence toward unfamiliar new technology. The construction industry adopts technological innovations far more slowly than it could -- and probably should. Some promising new technology goes unused for many years due to "institutional barriers" to wide dissemination....

The organization of the industry, splintered as it is into myriad segments each more concerned with its own preservation than overall advances, may well account more than any other single reason for this inertia. Moreover, an array of institutional barriers blocks the spread of new technology from where it originates to places were it might be used to cut building costs and increase productivity. A CICE study team identifies the major impediments as these: restrictive building codes and technical standards; some labor agreements and craft jurisdictional issues; liability and other legal considerations; lack of profit motive or other compelling incentives; counterproductive contractual relationships and government regulations; industrial inertia; and communication difficulties. The list, long familiar to most construction executives, typifies the intertwining of problems that tend to tether construction to the past.

... Commercial construction appears to be well in the lead over the past two decades, despite the absence of any visible research and development structure. Intense competition has prompted developers, designers and owners to work together to cut costs. Computerized design systems save expensive time in planning, for instance, and contracts written with performance specifications enable contractors and their subcontractors to adopt practical new techniques.

In contrast, the spread of new construction technology has been comparatively modest in general industrial construction, process-industry (refineries, chemical and cement plants, etc.) and power plants. Buyers of factories are usually more interested in a trouble-free facility than one made less costly by a new technology that has not yet become standard practice. Companies that own process plants focus on improving the technology of the process or the product, rather than on better ways to erect the maze of equipment and controls that form a plant....

... [C]onstruction has long lagged behind most other industries in technical progress. Perhaps the biggest reason is that the largest and most costly kind of construction, power plants and heavy industrial facilities, are unique in two ways: each lies on a different piece of land and hardly any two are technically alike, though elements of many are somewhat similar. Construction companies have considered, probably justifiably, that money spent on research was not money well spent....

... [T]he study team extracted ... insights about what portions of construction offer the highest potential for cost cutting via technological research. Result: **piping, electrical work** and **installation of mechanical equipment.** But in each of the four sectors, the opportunities for cost saving via better technology are different. In buildings, improvements are most needed in structure, enclosure skin, interior finishes and electrical work. In light industrial projects, again in descending order of priority, it's structure, piping and electrical work. For heavy industrial projects, it's piping, electrical and then mechanical equipment. In power plants, the pecking order is piping, mechanical equipment and then electrical work.

... University of Texas researchers interviewed 51 craft superintendents and field engineers at 14 sites in the Southwest, Midwest and West, and in mid-Atlantic states to pinpoint precise construction inefficiencies and opportunities for improvement. The overall conclusion: dramatic economic gains might well flow from research and technological improvement in eight areas: 1) piping, 2) installation of mechanical equipment, 3) electrical work, 4) structure, 5) vessels, 6) heating, ventilating and air conditioning, 7) installation of special equipment, and 8) instrumentation....

Modern Management Systems: A Little-Used Tool

... What's needed, briefly stated, is much more accurate and timely controls over design, planning and scheduling, budgeting, procurement, material logistics, and quality assurance. Among other things, this requires more extensive use of computers to help control decision making and its timing. These steps grow increasingly important to enable owners and contractors to control costs as today's utility and industrial projects become increasingly more complex....

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* More Construction for the Money (Summary Report of the Construction Industry Cost Effectiveness Project). HAP 3. Shortcomings of Management. The Business Roundtable, January 1983.

HARNESSING RESEARCH AND TECHNOLOGY IN THE CONSTRUCTION INDUSTRY *

Technological progress is probably more difficult in construction than it is in most other industrial fields, because the construction industry is broken into so many virtually independent parts and pieces. ... One result of limited spheres of influence and limited geographical range is a void in information channels linking the entire industry. So information about new technology has to be fed a drop at a time into a lot of places, rather than into a central organization that spreads it where it's needed.

A CICE study team concludes that if much is to be accomplished to speed the snail's pace of new technology from inventor to wide use in construction, owners will have to take the lead. No other participant in the industry has either the money, or the incentive. Presumably owners would need to undertake joint action, since their own interests diverge, and few can recapture the cost of innovating from a single use. Still, the study team reports documented returns ranging from 10 to 1 to 20 to 1 are common for time and labor-force training spent putting new construction technology to work in specific projects. The study team urges owners to collaborate in forming a national institute to gather information and transfer the data to organizations that could use it. The plan, in part, is to try to involve potential users of promising ideas in financing their development to the point of commercial use.

There is no shortage of specific problems for innovative scientists to tackle. **Piping**, for instance, appears to be the most inefficient among the major areas of construction. Alignment is often difficult and time-consuming because of the close tolerances required. Tools often have to be made on the job site -- an awkward place for that kind of work -- to align large-diameter pipe. Flexible pipe would allow greater tolerances as would flexible bends. Another useful device would be an interflange connection device that would permit slight alterations in the direction of a pipe. Perhaps more accurate alignment equipment could be devised. On some sites the old fashioned plumb bob and level are still the standard tools for the tricky job. Laser technology looks promising as a more up-to-date technique.

Connections require a quarter of the total time for installing pipe -- at least in industrial projects and power plants, where there can be miles of piping. Most of the problems involve welding; one is the bulkiness of welding equipment; some piping superintendents report that it takes a crew -- a welder and a pipefitter -- an hour or more to dismantle their apparatus and move it to the next location. Is there a way to improved the design for the connection? Standardized connections would help, so would a flange with a built-in gasket.

At congested sites, lifting pipe into place can be an awkward job. Cranes, when used, require a lot of space to maneuver, both on the ground and in the air. Communication between the crane and the crew doing the installation sometimes leads to coordination problems. If the inefficiencies in installing pipe could be reduced to a process as efficient as the average of all other operations, the cost saving would reach an estimated $5 million for a typical power plant.

Installing mechanical equipment -- a major cost in industrial projects and power plants -- involves complicated difficulties in alignment and leveling. Tolerances in alignment can be very close. The job is complex, requires great skill and depends heavily on accurate technical information in the hands of the crew. One key to alignment is tools that are internally controlled. Computer chips and lasers should enable crews to make more accurate measurements. A device is needed to align piping and shafts to tolerances programmed into its memory, avoiding tedious and time consuming manual alignment. Alternatively materials could be devised that don't require such close tolerances. Flexible joints or self-aligning joints would make it much easier and less costly to install rotating equipment, which is very sensitive to any pressure placed on it by piping or rotating shafts that are improperly aligned.

Tolerances for leveling may be as small as 1/8th of an inch. Available tools, such as hydrosets, are usually not accurate enough, time consuming and require great skill. Laser technology holds promise for doing this better.

In **electrical work**, tasks cry for improvement, installing cable raceways and testing are complicated and awkward parts of the job; raceways must be put in place by hand -- when numerous craftsmen from other trades are competing to use the same space. Flexible conduit would solve some of these problems, and plug-in connectors would help.

Pulling wire through conduits is a troublesome task. It is hard to avoid damaging the wire even though most crews use improved wire-protection material and lubricants such as soapstone. The operation has been speeded up -- a bit --by mechanical tuggers. But they don't respond to tension on the wire, so the operator cannot always tell if the wire snags. What's needed is a tugger with built-in drag, like a fishing reel. Mineral-insulation cable eliminates the need for conduit, but appropriate uses for it are limited. A wire puller is needed that could be used as the conduit is installed -- perhaps with adhesive slip-ring connectors. It would reduce the risk of wire damage in pulling and eliminate the return trip by a crew to do the wire pulling long after the conduit is in place.

On balance, more research and development is needed to promote technological progress in construction. Assuming that the potential cost benefit ratio should be at least 100 to 1, an industry-wide outlay of $20 million per year would be justifiable only for R&D on three items: piping, installing mechanical equipment, and electrical work.

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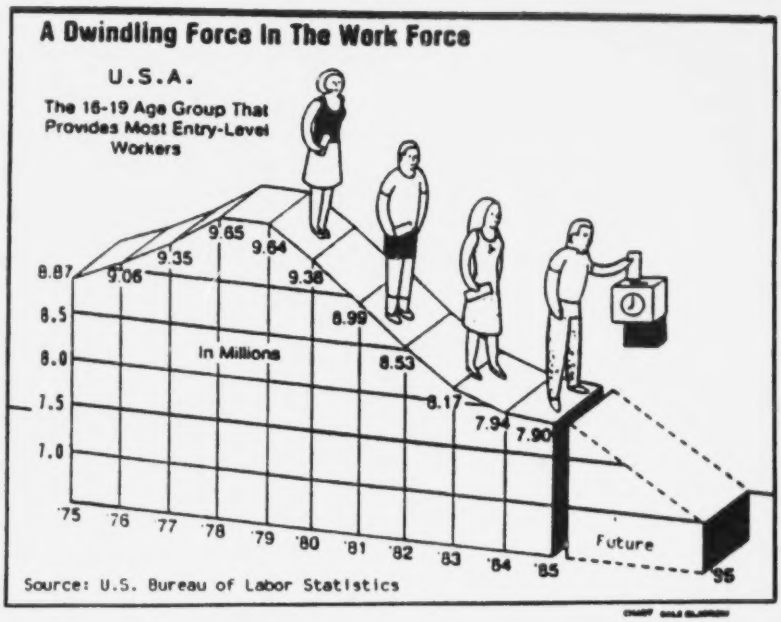
* From "Harnessing Research and Technology", More Construction for the Money (Summary Report of the Construction Industry Cost Effectiveness Project). The Business Roundtable, January 1983. [Underlines and boldface are added.]

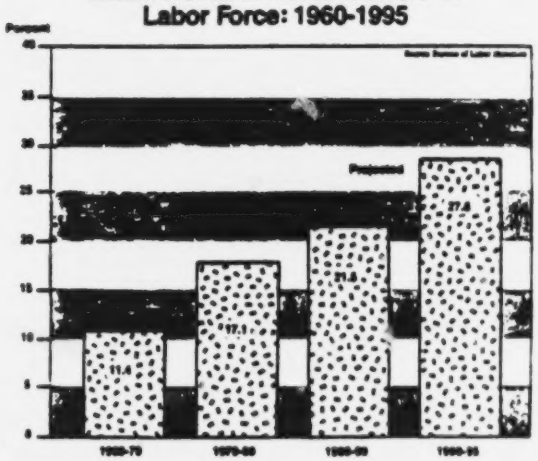
III THE NATION'S LABOR FORCE

LABOR-FORCE CHARACTERISTICS

The labor force, like the population, is aging, causing an increasing number and proportion of the (ex-perienced) labor force to retire and to need to be replaced. However, also as with the population as a whole, the number of youth entering the labor force has been declining and is expected to continue declining until the mid-1990s. A major effect of this shrinking number of young potential workers is increasing competition among education institutions, the military, and business or industry to attract those youth who are most qualified.



Black Workers: Percent Share of Labor Force: 1960-1995



Source: "Here They Come, Ready or Not," Education Week (Special Report), May 14, 1986, Vol. V (No. 34), p. 31.

While the youth in the labor force has been dropping, an increasing number and proportion of new labor-force entrants are from disadvantaged backgrounds (e.g., high-school dropouts) and lacking necessary employment education and skills, and the numbers and proportion of Minorities entering the labor force has been increasing and is expected to continue growing. Rapidly increasing are Blacks and Hispanics, who are more likely to have disadvantaged backgrounds, and Asian Americans, who are more likely to be well-educated and work-oriented. Also increasing, however, are the numbers and proportion of White disadvantaged potential workers.

The population explosion in Southern and Far Western states has greatly enlarged the labor force and consumer demand in these states. As with population shifts, manufacturing jobs have been shifting from the North to Sun Belt states. Even during the last three years when manufacturing employment was declining overall, manufacturing employment in Sun Belt states was increasing, both in rejuvenated heavy manufacturing and in light manufacturing. Even so, the overall decline in the traditional heavy-manufacturing locations more than offset the gains in the Sun Belt. Many Northern states offset these losses in manufacturing jobs with increases in (typically lower-paying) service jobs.

Employers will be begging for skilled workers, while the unskilled are left out

BUSINESS

The great jobs mismatch *

This Labor Day and for the rest of the century, the U.S. is hanging out a "Help Wanted" sign -- but only selected applicants need apply. Not only is the pool of new workers shrinking fast, there's also a growing mismatch between the skills they bring to the job and those employers are crying for.

The scramble could herald a golden decade of rising salaries and greater job opportunities for anyone trained to handle advanced technologies and complex information. More women will get the chance to move up to managerial and technical positions. Opportunity will knock for many baby-boomers sidetracked in the 1970s. Trained immigrants will be sought after. But for people without a college education or experience, the century's closing years could be an economic dark age.

Looking at the numbers, the U.S. labor force is on a demographic roller coaster, careening from the baby boom to the baby bust. Between now and the year 2000, the supply of new job seekers will barely inch ahead, expanding by just over 1 percent annually. That follows the '60s and '70s, when waves of baby-boomers, immigrants and female workers swelled labor's ranks by 2.4 percent a year -- growing faster than the population of India. Today, the nation counts 35.4 million 16-to-24-year-olds as the prime source of new labor. That's 1.1 million fewer than just a decade ago. And the number of youth of that age is expected to fall 5.1 million more in the next 10 years.

With fewer new workers to choose from, "the economy is catching fire for almost anyone with good education and experience," says Gordon Berlin of the Ford Foundation. Jobs for accountants, for example, are expected to jump by 40 percent, to 1.3 million, by the turn of the century, according to the government's Bureau of Labor Statistics (BLS). Slots for doctors, teachers and other professionals are forecast to soar by 3.7 million or nearly 30 percent.

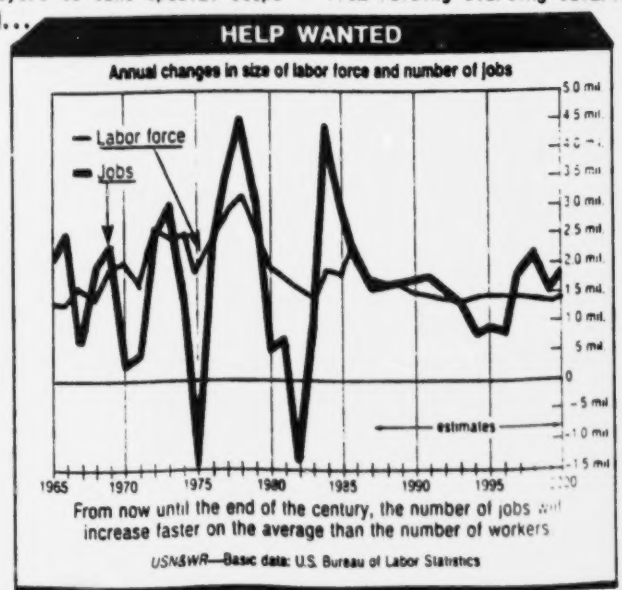
But behind that good news, "there is a widening gap between what the economy requires and what the new labor force will provide," says Thomas Espenshade, senior research associate at the nonprofit Urban Institute. He estimates that through the end of the century, three fourths of all new jobs will need people with some college education and skills -- while only about half of all new workers are likely to have gone beyond high school. Moreover, computerization of the workplace will move millions of today's lower-level jobs out of the reach of the less skilled. ... As a result, the labor force may well include a growing army of unskilled workers, especially young blacks and Hispanics, facing at best fitful employment.

Boom time for baby-boomers

The squeeze for new skilled labor is forcing many employers to take special steps -- from raising starting salaries to expanding retraining programs -- to get the people they need...

However, the big winners in coming years may well be educated and experienced baby-boomers. Some of those boomers, forced in the 1970s to take jobs for which they were overqualified, will get second chances to shift directions and move up. "Companies paying top dollar are figuring out they can find 30-year-olds with experience who will gladly work nearly as cheaply as the top new graduates," says Victor Lindquist, head of job-placement services for Northwestern University.

Even more important for the boomers, many firms are easing the labor squeeze by expanding on-job retraining. ... Says Peter Cannon, Rockwell [International's] chief scientist: "We need certain numbers of skilled people, and we will do what we have to to get them. With the demographics of the baby bust, it's cheaper to retrain those we've already got."



*Source: U.S. News & World Report, September 7, 1987, pp 42-43.

The tightening market for skilled labor will also help working women. The gap between women's and men's wages -- what Columbia University economist David Bloom calls "one of the remarkable constants in economics for over 30 years" -- already is beginning to close. In the last six years, the ratio of women's wages to men's rose from 60 to 65 percent. And the Census Bureau reports that working women, age 20 to 24, now earn on average only 16 percent less than young men -- compared with a 23 percent gap in 1980.

More choices for women

The wage gap will close even faster if, as expected, the labor squeeze lures more women to higher-paying occupations. ... There are signs that more women are being drawn to male-dominated fields: Some 40 percent of new business-school students are women.

Whatever their jobs, more women will take their places in the working world -- if only because more women now consider meaningful and well-paid work to be a desirable and achievable goal. The BLS estimates that, by 1995, 81 percent of adult women age 25 to 44 will hold jobs, as against 72 percent today.

Even more than in the past, America is becoming a land of special opportunity for highly skilled immigrants. Because of a dearth of homegrown applicants, foreign-born and trained doctors accounted for 295 of the 1,752 first-year residents and interns hired in 1986 by New York City's public medical facilities. Foreign-born students, many of whom will stay to work, earn more than half of new Ph.D.'s in engineering from U.S. universities and nearly one third of doctorates in physics.

Hard Times for Minorities

For all its opportunities, the new American labor market won't be a welcome place for those without a sheepskin or special skills. Minorities may find themselves in special peril. Nearly half of all new workers between now and 2000 will be black or Hispanic -- groups "disproportionately represented among those with less education," according to a new Labor Department study of Americans' job prospects in the 1990s.

Pages of want ads for counter jobs at fast-food restaurants show that there is still work for those with few skills. In some areas, fast-food outlets short of teenage help are taking on recent retirees, and experts say new jobs in restaurants, especially part time, will mushroom through the '90s. The problem for young, inner-city job seekers is that most of the jobs are in prosperous suburbs, out of commuting range. The same Catch-22 is forecast for agriculture, especially in the West, if immigration restrictions cause labor shortages.

The pinch on the low-skilled will be aggravated by a continuing slide in well-paid blue-collar jobs. The Department of Labor estimates that U.S. manufacturing, which lost 2 million jobs over the last seven years, will lose 834,000 more by the year 2000. What's more, jobs still open to the low-skilled are paying less. Adjusted for inflation, the average earnings of 30-year-old high-school dropouts plummeted by 41 percent, to less than $11,000, from 1973 to 1985, and the trend continues. For 30-year-old high-school graduates, average earnings fell by some 30 percent to $17,200 during the period. It is only the college grads whose inflation-adjusted incomes at age 30 are moving up again, after remaining steady at around $26,000 from '73 to '85.

WHERE THE JOBS WILL BE

10 fastest-growing occupations	Change 1988-2000
Paralegal personnel	104%
Medical assistants	90%
Physical therapists, assistants	86%
Data-processing-equipment repairers	80%
Home-health aides	80%
Computer-systems analysts	76%
Medical-record technicians	75%
Employment interviewers	71%
Computer programers	70%
Radiology technologists, technicians	65%
...And 4 that will lose jobs	
Electrical, electronic assemblers	-54%
Industrial truck, tractor operators	-34%
Stenographers	-28%
Farmers, farm workers	-25%

*Note: Projections are among occupations with 25,000 workers or more and assume moderate economic growth.
USA&WR—Basic data: U.S. Dept. of Labor

All the evidence "points to growing economic inequality," says University of Maryland economist Frank Levy. And that poses the danger that the U.S. will enter the 21st century as a nation of haves and have-nots glaring at each other across a deep divide defined by education and skills.

A SHALLOW LABOR POOL SPURS BUSINESSES TO ACT TO BOLSTER EDUCATION (HIGHLIGHTS)*

... The labor pool of younger workers who historically fill entry-level jobs is declining in both numbers and quality, for reasons ranging from the demographic to the social, while the jobs waiting for them require ever more knowledge and skill.

Alarmed by this double whammy -- and by the cost of screening applicants and providing special training -- business is trying to get more involved in improving basic general education....

Methods of Attack

Some businesses are reacting by jumping into politics and twisting arms to win educational reform and bigger school budgets. Others are financing teacher and student scholarships, research and school-budget supplements. Still others are fighting high dropout rates and enticing students to read more. (Separately, companies are getting more involved in internal educational programs to help employees advance their careers....)

The early returns from the companies' educational efforts are promising, but the problem isn't amenable to a quick fix....

Though only a relatively small percentage of Americans have trouble reading or writing a simple passage and counting out bus fare, a distressing number can't do much more than that. The Federal Education Department estimates that the U.S. has 17 million to 21 million functional illiterates, people whose meager skills aren't up to the demands that life and work place upon them.

Expensive Mistakes

They commit many costly blunders ... $2,200 on a $22 settlement ... misordered $1 million in parts ... misread a label and killed a pen of cattle. ... To forestall such problems, one of every three major U.S. corporations now provides some form of basic skills training for employees.... [P]roductivity losses caused by poorly educated workers, together with the price of remedial training, costs business about $25 billion a year.

That is bad enough. But business is even more concerned as jobs requiring more than the most basic reading, writing and computational skills become the fastest growing sector of the labor market.

Fundamental Flaws

... [T]he total number of young people in the labor pool will constrict sharply as the generation of the baby boom gives way to that of the baby bust. Second, a rising proportion of those people in the pool will be minority-group members -- the very group that schools have had the least success in educating.

Also, more people who once went into entry-level jobs after high school now go to college, meaning that those left for employers to choose from are generally the less accomplished and less ambitious members of their classes....

The explosion of new opportunities for women has contributed mightily to that. ... While all this is happening, entry-level jobs are growing more complex and demanding....

Think Small...

In a number of cases, employers are concentrating on specific aspects of the educational problem ... the nature of the learning process itself ... the dropout rate ... poor attendance and grades ... reading ... teaching. ... [I]n recent years business has been instrumental in forcing costly reforms through reluctant legislatures....

Boston Compact

It is too early to say with any certainty whether the corporate efforts to improve education will add up to a markedly improved work force in years to come. But the so-called Boston Compact provides an encouraging sign. Five years ago 200 Boston-area companies challenged local schools to register 5% annual improvements in school attendance, the high-school drop-out rate, and college and job placements. In turn, the companies promised to expand part-time and summer jobs for high-schoolers, and to hire more graduates full time.

Several major concerns have since set up endowments for teacher fellowships, dropout prevention measures and experimental programs schools couldn't afford. The Compact now offers financial aid to any Boston public high-school graduate who wants to continue his education.

The experiment has been deemed ... successful.... Meanwhile, the Compact has build up ... [*]good-faith money that shows we want this to continue in perpetuity. ... One of the things we've learned is that change doesn't come overnight."

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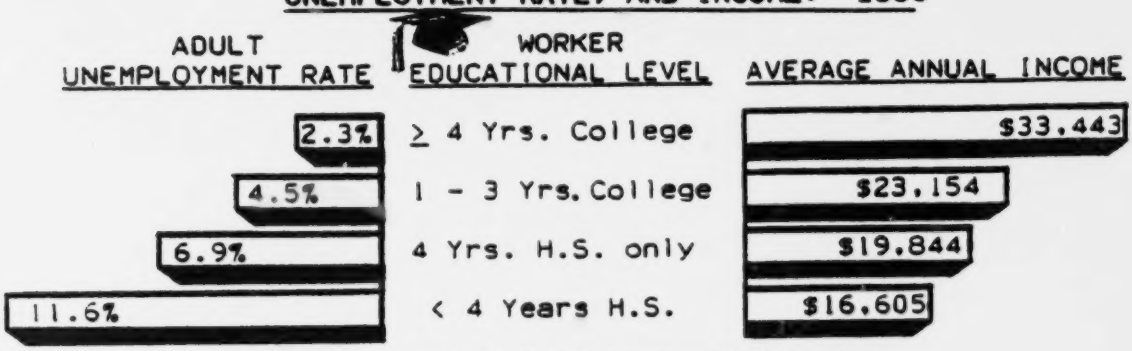
*Source: J.C. Simpson, The Wall Street Journal, Monday, Sept. 28, 1987, pp. 1,19.

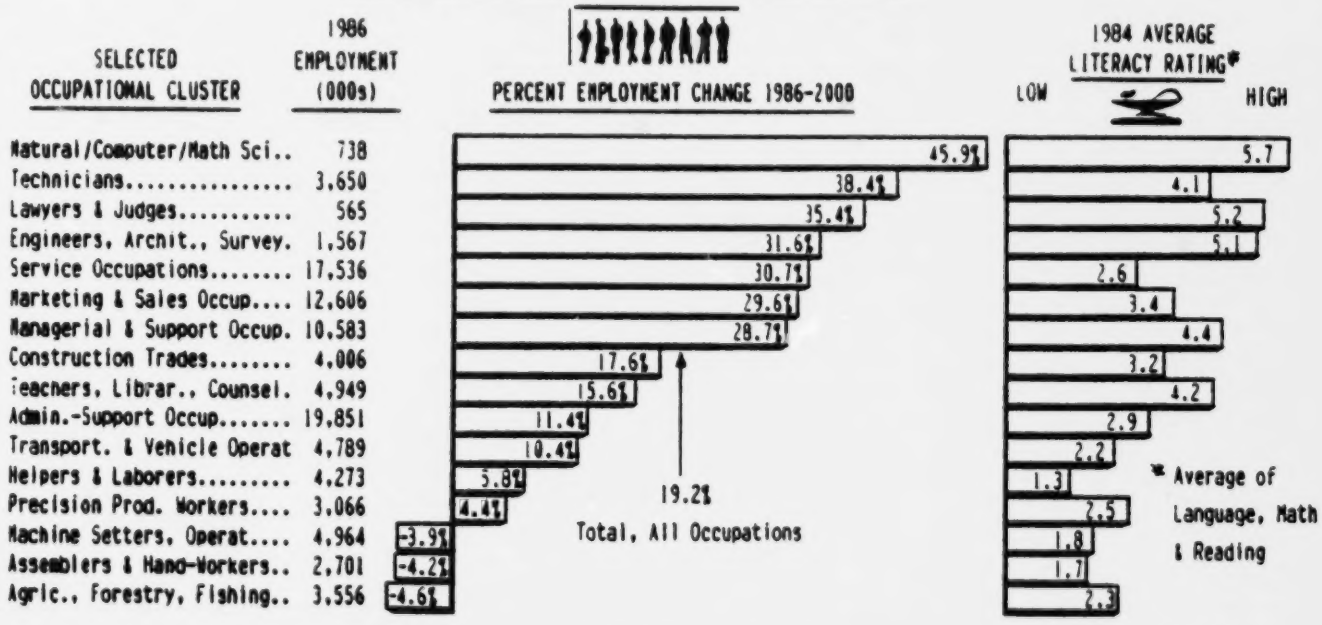
RELATIONSHIPS AMONG EDUCATIONAL LEVEL, UNEMPLOYMENT RATE, AND INCOME: 1986



Source: "Projections 2000," Occupational Outlook Quarterly. Fall 1987, p.36.

The chart above graphically illustrates that: (1) the higher the formal educational level, the greater the average annual income and (2) the lower the formal educational level, the higher the unemployment rate. -- Just two more ways to show that education pays off.

THE CHANGING U.S. LABOR FORCE (1986 - 2000) AND LITERACY SKILL LEVELS BY SELECTED OCCUPATIONAL CLUSTER:


SELECTED OCCUPATIONAL CLUSTER
1986 EMPLOYMENT (000s)
PERCENT EMPLOYMENT CHANGE 1986-2000
1984 AVERAGE LITERACY RATING*
LOW
HIGH
Natural/Computer/Math Sci.. 738 45.9% 5.7
Technicians..... 3,650 38.4% 4.1
Lawyers & Judges..... 565 35.4% 5.2
Engineers, Archit., Survey. 1,567 31.6% 5.1
Service Occupations..... 17,536 30.7% 2.6
Marketing & Sales Occup.... 12,606 29.6% 3.4
Managerial & Support Occup. 10,583 28.7% 4.4
Construction Trades..... 4,006 17.6% 3.2
Teachers, Librar., Counsel. 4,949 15.6% 4.2
Admin.-Support Occup..... 19,851 11.4% 2.9
Transport. & Vehicle Operat 4,789 10.4% 2.2
Helpers & Laborers..... 4,273 5.8% 1.3
Precision Prod. Workers.... 3,066 4.4% 2.5
Machine Setters, Operat.... 4,964 -3.9% 1.8
Assemblers & Hand-Workers.. 2,701 -4.2% 1.7
Agric., Forestry, Fishing.. 3,556 -4.6% 2.3
19.2%
Total, All Occupations
* Average of Language, Math & Reading

Source: G.T. Silvestri & J.M. Lukasiewicz, "A Look at Occupational Employment Trends to the Year 2000." Monthly Labor Review, Sept. 1987, Vol. 110 (No. 9), pp. 46-63 (Also see Manpower Tid-Bit 87-7, Office of Manpower Studies, Purdue University). And W.B. Johnston & A.E. Packer, Workforce 2000, Indianapolis, IN: Hudson Institute, June 1987.

Much has been written about the growing necessity for all to have mastered the basic academic skills. Looking at future employment projections, the conclusion must be drawn that the fastest growing occupations will require the highest literacy ratings. -- More evidence of the critical nature of a solid education foundation.

IV THE CONSTRUCTION INDUSTRY

CONSTRUCTION (GENERAL) *

The constant-dollar value of new construction put in place in the United States in 1988 will be about the same as the near-record level of 1987. Although the number of housing starts will decline, the value of residential construction put in place will increase slightly because of home improvement expenditures and the trend toward larger homes. Commercial construction will continue to decline, especially office buildings and hotels. Public works construction will increase moderately. Foreign construction contracting by U.S. firms will decline in 1988 because of weak markets, [less attractive financing] and intensifying competition.

Outlook for 1988

The constant-dollar value of construction in 1988 will be about the same as in 1987, but certain categories of construction will increase solidly. The most promising markets appear to be home improvement, manufacturing facilities, hospitals, schools, water and sewer systems, and public service buildings. The weaker markets will be apartments, office buildings hotels, other commercial building, and electric power generation. Difficult international market conditions will continue in 1988 because low commodity prices and debt repayment problems will limit development projects in most of the major Third World markets.

The number of housing starts will decline slightly to less than 1.6 million units, but the value of residential construction will remain largely unchanged because of increases in average house size and continued growth in home improvement expenditures. Private nonresidential construction will continue to decline, primarily because of high vacancy rates for commercial buildings and the elimination of major tax benefits for commercial real estate investment. Public works construction will continue to increase modestly, as solid increases in state and local spending offset small declines in Federal construction expenditures.

Long-Term Prospects

Demand for commercial construction will be depressed for the next few years by an oversupply of buildings and the effects of tax reform, but the outlook for most other types of construction is fairly optimistic. The macroeconomic forecast predicts conditions that are favorable for construction -- continued economic growth, fairly stable interest rates, slow inflation, declining Federal budget deficits, and declining trade deficits. Given this macroeconomic scenario, the overall value of construction put in place should remain near current levels in 1988 and 1989 and then set new records in the early 1990s....

The U.S. construction industry will face a number of challenges during the next 5 years, including foreign competition. Supply of workers, and liability insurance. The foreign construction contractors now entering the U.S. market generally are well-financed and often possess construction expertise equal or superior to American capability. Barring substantial productivity gains, labor shortages and labor quality could become major problems as the supply of young workers available to the U.S. construction industry dwindles because of demographic trends and low unemployment rates. The cost of liability insurance will probably stabilize during the next several years, but long-run insurance trends are largely dependent on legislative and judiciary developments in tort reform.

* Source: U.S. Industrial Outlook 1988 -- Construction

In terms of dollar output, the construction industry has been growing at an average annual rate of at least one percent since 1972, at which time the dollar output was $394 billion. In 1986, the dollar output had increased to $462 billion. It is projected to increase even more rapidly (1.5% annually) by the year 2000, reaching $560.5 billion. However, not all types of construction have or are expected to participate in this increase equally. This is especially true for new farm housing, alterations and additions and new nonfarm housing other than single units. In contrast, types which have and are expected to continue increasing faster than the average are new commercial buildings, new electric utility facilities, new nonfarm buildings not elsewhere classified, maintenance and repair construction, and new water supply and sewage facilities. *

Finally, maintenance and repair construction represents the largest percentage of dollar output of all types of construction. This dollar output grew from $84 billion in 1972 (21% of the total) to $136 billion in 1986 (30%) and is projected to increase to $174 billion by 2000 (31%).

DOLLAR OUTPUT BY TYPE OF CONSTRUCTION: 1972 TO PROJECTED 2000

(Moderate Trend: Billions of 1982 $)

TYPE OF CONSTRUCTION	DOLLAR OUTPUT						AVERAGE ANNUAL RATE OF CHANGE			
	Actual				Projected					
	1972	1979	1982	1986	1995	2000	'72-79	'79-86	'86-95	'86-00
TOTAL CONSTRUCTION.....	$394.2	$422.7	$336.6	$461.7	$522.6	$560.5	1.0%	1.3%	1.5%	1.5%
New NonFarm Housing.....	122.8	107.4	59.0	120.0	123.0	124.8	-1.8	1.7	.3	.3
Single units.....	76.1	84.5	41.2	90.2	97.1	101.4	1.6	1.0	.9	.9
Other.....	46.7	22.9	17.8	29.8	25.8	23.4	-7.3	4.3	-1.5	-1.5
NonFarm Residential Alter.& Add.	18.2	27.7	21.3	31.9	34.9	36.8	7.5	2.1	1.1	1.1
New Farm Housing, Alter.& Add...	1.7	1.5	1.5	.9	.7	.6	-2.3	-5.1	-2.5	-2.6
New Industrial Buildings.....	10.7	19.0	17.2	12.1	13.9	15.0	11.1	-5.2	1.7	1.7
New Commercial Buildings.....	36.1	36.4	41.3	54.7	70.9	80.8	.1	7.2	3.3	3.4
Office buildings.....	15.8	14.8	25.5	27.8	35.8	40.6	- .8	12.4	3.2	3.3
Other.....	20.3	21.5	15.9	27.0	35.1	40.1	.8	3.6	3.4	3.5
New Educational Buildings.....	16.3	10.3	7.5	9.5	10.1	10.5	-5.2	-1.1	.7	.7
New Hospitals and Institutions..	9.5	6.8	8.3	6.9	7.6	8.0	-4.1	.2	1.1	1.2
New NonFarm Buildings, nec.....	12.2	9.5	9.8	15.1	18.4	20.4	-3.2	8.4	2.4	2.5
New Communications Facilities...	7.0	7.8	7.0	6.7	7.6	8.2	1.6	-1.9	1.5	1.6
New Electric Utility Facilities.	18.8	20.5	17.8	15.2	18.5	20.5	1.3	-3.7	2.4	2.5
New Water Supply & Sewer Facil..	7.7	13.3	10.4	13.1	15.2	16.5	10.3	- .2	1.8	1.9
New Gas Utility & Pipeline Fac..	4.7	3.8	3.6	3.5	3.5	3.5	-2.7	-1.0	.0	.0
New Roads.....	27.7	17.3	16.1	21.5	24.5	26.2	-5.3	3.4	1.5	1.6
New Local Transit Facilities....	1.1	.8	1.1	1.0	1.0	1.0	-3.9	4.5	- .1	- .1
New Conserv. & Develop. Facil...	4.1	4.7	4.1	3.8	3.6	3.5	2.2	-2.8	- .4	- .4
New NonBuilding Facilities, nec.	11.5	15.0	10.9	9.3	9.7	9.9	4.4	-5.4	.5	.5
Maintenance & Repair Construct..	84.2	120.9	99.8	136.4	159.4	174.1	6.2	1.8	1.9	2.0

SOURCE: Valerie A. Personick, Office of Economic Growth and Employment Projections, U.S. Department of Labor, Bureau of Labor Statistics, 441 "G" Street, N.W., Washington, D.C. 20212.

* It is noteworthy that these are the types of construction U.A. members are most likely to be employed in.

CONSTRUCTION EMPLOYMENT *

The increase in construction employment is not expected to be as great as the expansion in construction activity. Continued technological developments in construction methods, tools and equipment, materials, and material movement will raise output per worker.

Employment in the construction trades ... is concentrated in industrialized and highly populated areas.

About 1 out of 4 skilled construction workers is self-employed and contracts with homeowners and businesses for small jobs. ... Most training authorities recommend formal apprenticeship training as the best way to acquire the all-round skills of the construction trades. In most communities, apprenticeship programs are supervised by joint apprenticeship committees composed of local employers and union representatives.... In areas where these joint committees have not been established, the apprenticeship agreement is solely between the apprentice and the employer....

Although apprenticeship provides the most thorough training, most people acquire construction skills informally by working as laborers and helpers and observing experienced workers and/or attending vocational or trade schools or by taking correspondence courses.

Plumbers & Pipefitters:

Apprenticeship is the best way for plumbers or pipefitters to learn all aspects of these trades. Most people, however, learn plumbing and pipefitting by working for several years as helpers to experienced plumbers and pipefitters. Apprenticeship programs for plumbers and pipefitters are administered by local union-management committees.

Most communities require plumbers to be licensed. To obtain a license, workers must pass an examination to demonstrate knowledge of the trade and of local plumbing codes.

In addition to jobs created by increased demand for plumbers and pipefitters, many openings will occur each year from the need to replace experienced workers who retire, die, or stop working for other reasons. Relatively few plumbers and pipefitters transfer to other occupations. ... Nevertheless, most job openings will stem from replacement needs.

[The unemployment rate in the construction industry generally is about twice that of all industries combined. However, the] employment of [plumbers and pipefitters] ... generally is less sensitive to changes in economic conditions than many other construction trades.

* Occupational Outlook Handbook, (1986-87 Edition: Bulletin 2250) Bureau of Labor Statistics, Washington, D.C., 1986.

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INDUSTRY AND OCCUPATIONAL EMPLOYMENT TRENDS TO THE YEAR 2000 **

The nation's total economy is projected to generate more than 21 million jobs between 1986 and 2000. While a considerable number, this 19 percent increase is only half the average rate of increase that occurred over the previous 14-year period, 1972-1986.

Trends by Major Industries

... More than 80 percent of the rise in total employment is projected to occur among wage and salary workers in wholesale and retail trade and in services. Increases in the number of marketing and sales and service workers are expected to account for almost half of the employment gains in these two industry divisions. [Underline added]

... Although most of the total employment change is projected to occur in trade and services, several other industry divisions have notable changes. Finance, insurance, and real estate is projected to account for 8 percent of the growth in total employment or 1.6 million jobs.... [Underline added]

** Source: Monthly Labor Review, Sept. 1987. U.S. Dept. of Labor, Bureau of Labor Statistics.

Another industry division adding significant numbers of jobs in construction, which accounts for 4 percent of the growth in total jobs. ... Construction employment is projected to rise by 890,000 between 1986 and 2000, to 5.8 million wage and salary jobs. The rate of increase, 1.2 percent a year, is just slightly below the projected total job growth in the economy. [Underline added]

... The real value of new and maintenance construction is projected to grow by 1.4 percent a year between 1986 and 2000, slightly faster than long-term historical trends but slower than the 2.4-percent projected for overall GNP growth. New construction is especially sensitive to cyclical fluctuations, but demographic factors play a part as well. Because of an expected slowdown in the rate of new household formation in the 1990's, residential construction is projected to slow dramatically. A little growth is expected for new single-family homes and for residential alterations and additions, but this will be just about offset by declines in new apartment and condominium construction and in farm housing. Nonresidential construction is projected to recover from the recent oversupply of office and commercial space, and will grow about 2.0 percent a year during the 1986-2000 period.

Employment in Construction (1000's)

1972	1979	1986	Proj. 2000	Change 1986-2000
3,089	4,463	4,904	5,794	+ 890*

* *Nearly half of this gain is expected to occur among the construction trades.*

Employment in Construction Industry

Aver. Annual Rate of Change (In Percent)

1972-79	1979-86	1986-2000
2.0%	1.4%	1.2

Government (excluding State and Local government employees in education and hospitals) is projected to account for nearly 4 percent of total employment growth (811,000 jobs).... [Underline added]

The manufacturing industry division is projected to decrease by more than 800,000 jobs. ... Many of the detailed occupations in these groups are expected to be affected by automation and a decrease in demand for the products of industries in which they are concentrated because of changes in consumer tastes, shifts in governmental priorities, and increases in foreign competition. Despite the drop in employment, some occupational groups within manufacturing are expected to grow. The group with the largest job increase is engineers, followed by managers and technicians. [Underline added]

The agriculture, forestry, and fishing division has a projected increase in employment among wage and salary workers, but if self-employed agriculture workers (includes farmers) are included, the industry shows a decrease. [Underline added]

The number of self-employed workers and unpaid family workers combined is projected to increase by 12.2 percent, from 9.8 million in 1986 to 10.9 million in the year 2000. [Underline added]

Trends for Construction Trades

Employment for carpenters is projected to grow by about 18 percent, or by 182,000 jobs -- the largest numerical increase among occupations in this cluster. Close to one-third of the gain is expected to occur among self-employed carpenters. The residential building and nonresidential carpentering and flooring industries are expected to add the bulk of the remaining jobs.

Employment in the electricians occupation is projected to grow by 89,000 jobs. Most of the increase is expected to occur in construction, which will more than offset job losses projected for electricians in manufacturing.

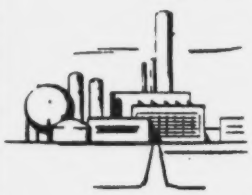
Employment for painters and paperhangers (construction and maintenance) is projected by 90,000 jobs. More than 40 percent of this increase is expected among self-employed painters and paperhangers.

Employment in the plumbers, pipefitters, and steamfitters occupation is projected to have an increase of 69,000 jobs, mainly occurring in construction. [Bold added]

In 1986, the construction industry represented 4.8 percent of all employment, with 4.9 million workers, more than half of which (2.8 million) were employed with special-trade contractors. By the year 2000, construction employment is projected to increase by almost 900,000 but represent only 4.7 percent of all employment because of a slightly lower projected growth rate than for all occupations (18.2% vs. 19.9%, respectively). However, employment for special-trade contractors is projected to grow slightly more rapidly (20.8%) than for all industries. Plumbing, heating and air-conditioning employment is projected to grow from approximately 626,000 in 1986 to 747,000 in 2000, at a rate (19.3%) slightly below the average.

U.S. WAGE AND SALARY EMPLOYMENT BY TYPE OF CONSTRUCTION: 1986 AND PROJECTED 2000

(NUMBERS IN THOUSANDS)



INDUSTRY	EMPLOYMENT 1986	EMPLOYMENT Projected 2000	EMPLOYMENT CHANGE Number	EMPLOYMENT CHANGE Percent
TOTAL, ALL INDUSTRIES	**101,868.3**	**122,088.9**	**20,220.6**	**19.9%**
Construction	4,903.5	5,794.0	890.5	18.2%
General contractors & operative builders	**1,293.3**	**1,481.0**	**187.7**	**14.5%**
Residential building construction	655.3	750.0	94.7	14.5%
Operative builders	56.4	34.0	-21.4	-37.9%
Nonresidential building construction	581.6	696.0	114.4	19.7%
General contractors, exc. building	**778.1**	**893.0**	**114.9**	**14.8%**
Highway and street construction	271.9	325.0	53.1	19.5%
Heavy constr., exc. highway & street	506.2	568.0	61.8	12.2%
Special-trade contractors	**2,832.1**	**3,420.0**	**587.9**	**20.8%**
Plumbing, heating, & air-conditioning	625.9	747.0	121.1	19.3%
Painting, paper hanging, & decorating	163.1	203.0	39.9	24.5%
Electrical work	522.2	633.0	110.8	21.2%
Masonry, stone, tile work, plastering	460.7	560.0	99.3	21.6%
Carpentering & flooring	173.7	211.0	37.3	21.5%
Roofing & sheet-metal work	207.0	260.0	53.0	25.6%
Concrete work	184.2	214.0	29.8	16.2%
Water well drilling	16.7	21.0	4.3	25.7%
Misc. special trade contractors	478.6	571.0	92.4	19.3%

SOURCE: *Valerie A. Personick, Office of Economic Growth and Employment Projections, U.S. Department of Labor, Bureau of Labor Statistics, 441 "G" Street, N.W., Washington, D.C. 20212.*

WORKFORCE NEEDS AHEAD FOR THE CONSTRUCTION INDUSTRY *

According to the U.S. Bureau of Labor Statistics and the Bureau of the Census, there is an increasing need for new construction industry workers of greater than 260,000 annually: 180,000 for replacement needs and 83,000 for growth needs. The construction industry has the greatest numerical need for new workers than any other specific industry. In addition, the greatest need is for unskilled workers, who comprise the largest category of construction labor and who have the least work attachment to the construction industry.

- There are at least six factors threatening the worker supply. These include the following:

- **Aging of the current workforce** -- need to replace increasing numbers of retiring workers.
- **Changing retirement patterns** -- decreasing number continue to work until standard retirement age, especially within construction crafts.
- **Decreasing number of young persons entering workforce.**
- **[Increasing proportion of new workforce entrants from at-risk groups**, who are less likely to enter the construction industry (e.g., Minorities)].
- **The increasing market for construction.**
- **Hindrances to maintaining balance between labor supply and demand.** First, these include cyclical swings in employment: There tends to be a reduction of apprenticeship enrollments when employment decreases, and this is possibly accentuated by reduced employment in union construction. Secondly, the geographical concentration of construction efforts can be a hindrance. The growth in construction and attraction of new workers have been concentrated in the South and in the West. In contrast, older, experienced workers are concentrated in areas with declining job opportunities and are less likely to relocate to find jobs.

- There are several possible special sources for supplying needed workers. These include the following:

- **Retired construction workers**, who are more likely to return to parttime work.
- **Workers with previous construction experience who are no longer working in construction industry:** The movement in and out of the construction industry is greater than previously believed, and factors attracting workers back into construction are undocumented.
- **[Special efforts to retain experienced workers longer.]**
- **[Increasing special efforts to attract, train and retain Minorities within the construction industry.]**

* *Robert Gasperow, "Meeting the Future Need for Construction Labor,"* Construction. Nov. 1985, Vol. LXVII (No. 11), pp. 29-32.

Construction Occupations

(Selected extracts from the Occupational Outlook Handbook, 1986-87 Edition, Bulletin 2250, U.S. Dept. of Labor, Bureau of Labor Statistics.)

Construction trades workers make up one of the largest groups of skilled workers in the Nation's labor force. These trades offer good opportunities for young people who are not planning to go to college but who are willing to spend several years learning a skilled occupation. Construction workers can find jobs in all parts of the country and also have greater opportunities to open their own businesses than workers in most other skilled occupations.

What are the Construction Trades?

Workers in the construction trades build, repair, and modernize homes and other kinds of buildings. They also work on a variety of other projects, including airports, mass transportation systems, roads, recreation facilities, and powerplants.

Construction workers may be grouped into three categories: Structural, finishing, and mechanical. *Structural workers* include: Bricklayers, carpenters, concrete masons, ironworkers, construction machinery operators, stonemasons, and boilermakers. *Finishing workers* include: Drywall installers and finishers, carpet installers, glaziers, insulation workers, marble setters, painters, paperhangers, plasterers, roofers, terrazzo workers, and tilesetters. *Mechanical workers* include: Electricians, pipefitters, plumbers, sheetmetal workers, and millwrights.

Most construction trades are described individually later in this section. Boilermakers and millwrights are described elsewhere in the *Handbook*.

Working Conditions

Construction work frequently requires prolonged standing, bending, and working in cramped quarters. Exposure to weather is common since much of the work is done outdoors or in partially enclosed structures. Many people prefer construction work because it permits them to be outdoors.

Construction workers may work with sharp tools, amidst a clutter of materials or on scaffolding. As a result, they have more injuries than workers in other jobs. Indeed, construction has the highest injury and illness rate of any industry. However, employers increasingly are emphasizing safe working conditions and stressing safe work habits—practices that reduce the risk of injuries. "Hard hats," steel-toed shoes, safety belts, and nets are some of the devices that help reduce risk.

Employment

Construction trades workers, excluding supervisors, held 4 million jobs in 1984. Most were employed by contractors in the construction industry. The vast majority of construction contractors employ fewer than 10 people. A few large contractors, however, employ thousands. Many construction workers are employed in other industries to do maintenance and repair work. For example, plumbers and pipefitters maintain the complex pipe networks in chemical processing plants. Government agencies employ construction workers to maintain highways, buildings, and sanitation systems.

About 1 out of 4 skilled construction workers is self-employed and contracts with homeowners and businesses for small jobs. Self-employment is most common in paperhanging, painting, and floor covering work, but it also is found in other trades.

Employment in the construction trades is distributed geographically in much the same way as the Nation's population. It is concentrated in industrialized and highly populated areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend formal apprenticeship training as the best way to acquire the all-round skills of the construction trades. Apprenticeship is a prescribed period of on-the-job training, supplemented by related classroom instruction designed to familiarize apprentices with the materials, tools, and principles of their trade. Formal apprenticeship agreements are registered with a State apprenticeship agency or the U.S. Department of Labor's Bureau of Apprenticeship and Training.

Apprentices generally must be at least 18 years old and in good physical condition. A high school education or its equivalent, including courses in mathematics and mechanical drawing, is desirable. Courses in construction trades, such as carpentry and electricity, also are recommended. Often, applicants are given aptitude tests.

The formal apprenticeship agreement generally calls for 3 to 4 years of on-the-job training and 144 hours or more of related classroom instruction each year. On the job, most instruction is given by a skilled worker to whom the apprentice is assigned.

Classroom instruction usually includes courses such as history of the trade, characteristics of materials, shop mathematics, and basic construction principles.

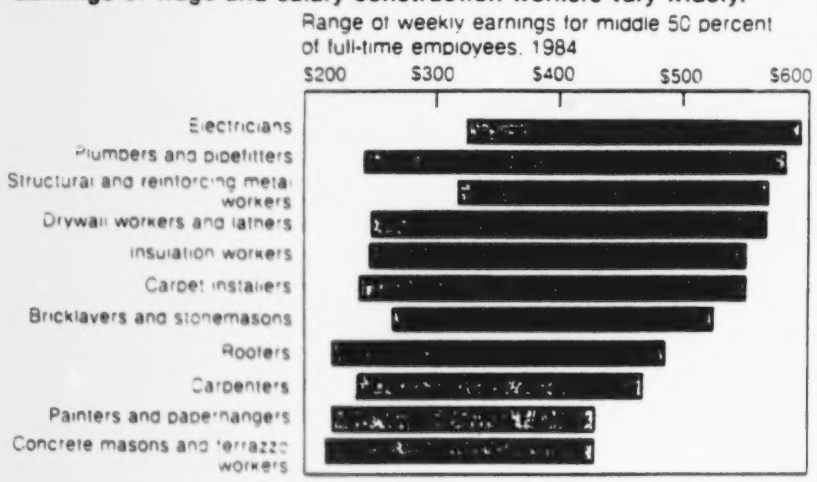
In most communities, apprenticeship programs are supervised by joint apprenticeship committees composed of local employers and union representatives. Committees determine the need for apprentices and establish minimum standards of education, experience, and training.

In areas where these joint committees have not been established, the apprenticeship agreement is solely between the apprentice and the employer. Many people have received valuable training under these programs, but they have some disadvantages. No committee is available to supervise the training offered and settle differences over the terms and conditions of training. And, if the employer lacks continuous work or does only a restricted type of work, the apprentice may find it difficult to develop all-round skills.

Although apprenticeship provides the most thorough training, most people acquire construction skills informally by working as laborers and helpers and observing experienced workers and/or attending vocational or trade schools or by taking correspondence courses.

In many localities, some construc-

Earnings of wage and salary construction workers vary widely.



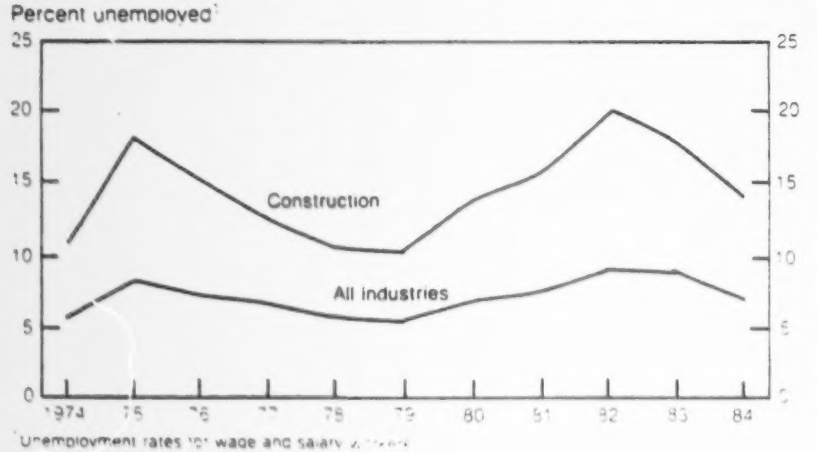
tion workers—most commonly electricians and plumbers—are required to have a license. To qualify for licenses, they must pass an examination to demonstrate a broad knowledge of the job and of State and local regulations.

Since construction requires a team effort, the ability to work well with supervisors, peers, and subordinates is vital. Manual dexterity is necessary to work quickly and accurately with trowels, hammers, chisels, levels, saws, drills, and other tools and machinery. The ability to solve mechanical and structural problems is important for many highly skilled construction trades. With guidelines from an architect, for example, a plumber might plan the layout of a plumbing system for a kitchen or bathroom to make the best use of existing plumbing and limited space. Precision, an eye for detail, the ability to picture objects from blueprints, and color discrimination also are vital.

Construction trades workers may advance in a number of ways. Many become supervisors. In most localities, small jobs are run by "working supervisors" who work along with members of their crews. On larger jobs, they just supervise. They also can become estimators for contractors. Estimators calculate material requirements and labor costs so contractors can bid on projects. Some workers advance to superintendents on large projects. Others become instructors in trade and vocational schools or sales representatives for building supply companies. A large number of construction trades workers become self-employed contractors.

Starting a small contract construction business is easier than starting a small business in many other industries. Only a moderate financial investment is needed to conduct a substantial business from one's home. However, the field is very competitive, and the rate of failure is high.

The unemployment rate in construction generally is about twice that in all industries combined.



Unemployment rates for wage and salary workers

Source: Bureau of Labor Statistics

Job Outlook

Employment in the construction trades is expected to increase about as fast as the average for all occupations through the mid-1990's. Anticipated rapid growth in business investment for new factories, office buildings, stores, hotels, powerplants, and other structures will stimulate demand for construction workers. Maintenance and repair work on all types of structures is expected to increase.

Earnings

Median weekly earnings for construction trades workers, not including supervisors, were about $367 in 1984. Wage rates for apprentices and other trainees usually start at 50 percent of the rate paid to experienced workers and increase at 6-month to 1-year intervals until the full rates are achieved upon the completion of training.

Wage rates generally were highest in the West and lowest in the South. Unionized workers generally earned more than nonunion workers. Except for a few trades, such as electricians and plumbers and pipefitters, yearly earnings for experienced workers and their apprentices generally are lower than weekly rates would indicate because poor weather and downturns in construction activity may limit the amount of work.

Winter is the slack period for construction activity, particularly in colder regions. Because construction trades depend on one another—particularly on large projects—work delays or strikes in one trade can delay or stop the work of others.

A large proportion of construction workers are members of trade unions affiliated with the Building and Construction Trades Department of the AFL-CIO.

Plumbers and Pipefitters

(Selected extracts from the Occupational Outlook Handbook, 1986-87 Edition, Bulletin 2250, U.S. Dept. of Labor, Bureau of Labor Statistics.)

Nature of the Work

By simply turning on a faucet, a person activates a long, complex system of pipes. Small copper or plastic pipes connect the faucet to the building's main water pipes. These pipes in turn are connected to the cast iron or concrete pipes of the municipal water system that run underground for miles to a water treatment plant. Larger pipes connect the plant to a river, reservoir, or other water source.

Other pipe systems dispose of waste, provide water to fight fires, and transport water and steam for cooling and heating. Pipe systems in powerplants play an essential role in producing electricity by carrying the steam that powers huge turbines. Pipes also are used in manufacturing plants to move material through the production process.

Plumbers and pipefitters install and maintain all these vitally important pipe systems. Although plumbing and pipefitting are sometimes considered a single trade, workers may specialize in either craft. Plumbers build and repair the water, waste disposal, drainage, and gas systems in homes and commercial and industrial buildings. They also install plumbing fixtures—bathtubs, sinks, and toilets—and appliances such as dishwashers and water heaters. Pipefitters build and repair both high- and low-pressure pipe used in heating, ventilating, and air-conditioning of buildings, manufacturing, generation of electricity, and transportation. They may specialize further, according to the type of pipe system with which they work. Steamfitters, for example, install pipe systems that move liquids or gases under high pressure. Sprinklerfitters install automatic fire control sprinkler systems in buildings.

Because the purpose, size, and operation of pipe systems differ, the materials and construction techniques used by plumbers and pipefitters vary by construction project. Water systems in homes, for example, use copper, plastic, and galvanized steel pipe that can be handled and installed by one or two workers. Municipal sewage systems, on the other hand, are made of large clay pipe. Installation normally requires crews of pipefitters.

Despite these differences, all plumbers and pipefitters must be able to follow building plans and instructions from supervisors, lay out the job, and work efficiently with the materials and tools of the trade. The following illustrates how plumbers use these skills to install piping in a house.

Working from blueprints or shop drawings that show the planned location of pipes, plumbing fixtures, and appliances, plumbers lay out the job to fit the piping into the structure of the house with the least waste of material and without damaging the structure. They measure and mark areas where pipe will be installed and connected. They also check for obstructions, such as electrical wiring, and plan how to install pipe around the problem.

To install the piping, plumbers may saw holes in walls, ceilings, and floors. They may hang steel supports from ceilings that will hold the pipe in place. To assemble the system, plumbers cut and bend lengths of pipe using saws, pipe cutters, and pipe-bending machines. They connect lengths of pipe with fittings; the method depends on the type of pipe used. For copper pipe, plumbers slide fittings over the end of the pipe and solder the fitting in place with a torch. For plastic pipe, plumbers simply connect the sections with adhesives.

When the piping is in place, plumbers install the fixtures and appliances and connect the system to the outside water and sewer lines. Using pressure gauges, they check the system to insure that the plumbing works properly.

Working Conditions

Plumbing and pipefitting work is demanding. Workers do a lot of heavy lifting and must stand for long periods. Plumbers and pipefitters work both indoors and outside in all types of weather. They often work in cramped and dirty places. They can be injured by falls from ladders, cuts from sharp tools, and burns from hot pipes or from soldering equipment.

Employment

Plumbers and pipefitters held about 395,000 jobs in 1984. Most work for mechanical and plumbing contractors engaged in new construction or repair, alteration, or modernization work. About 1 out of 6 plumbers and pipefitters is self-employed. Some plumbers install and maintain pipe systems for government agencies and public utilities, and some work on the construction of ships and aircraft. Others do maintenance work in industrial and commercial buildings. Pipefitters, in particular, are employed as maintenance personnel in the petroleum, chemical, and food-processing industries where manufacturing operations require the moving of liquids and gases through pipes.

Jobs for plumbers and pipefitters are distributed across the country in about the same proportion as the general population.

Training, Other Qualifications, and Advancement

Apprenticeship is the best way for plumbers or pipefitters to learn all aspects of these trades. Most people, however, learn plumbing and pipefitting by working for several years as helpers to experienced plumbers and pipefitters.

Apprenticeship programs for plumbers and pipefitters are administered by local union-management committees comprised of members of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry and the Mechanical Contractors Association of America, Inc., or the National Association of Plumbing-Heating-Cooling Contractors. Apprenticeship programs also are administered by local chapters of the Associated Builders and Contractors and the National Association of Plumbing-Heating-Cooling Contractors. Apprenticeships consist of 4 or 5 years of on-the-job training, in addition to at least 216 hours annually of related classroom instruction. Classroom subjects include drafting and blueprint reading, mathematics, applied physics and chemistry, safety, and local plumbing codes and regulations.

On the job, apprentices first learn basic skills such as identifying grades and types of pipe, the use of the tools of the trade, and the safe unloading of materials. As apprentices gain experience, they learn how to work with

various types of pipe and to install different piping systems and plumbing fixtures.

People learning the trade as helpers acquire their skills by observing and assisting experienced plumbers and pipefitters. These workers may not learn to work with as wide a variety of materials and piping systems as apprentices.

Applicants for apprentice or helper jobs generally must be at least 18 years old and in good physical condition. Employers prefer high school graduates. Courses in shop, plumbing, general mathematics, drafting, blueprint reading, and physics are helpful. Applicants may be given tests to determine whether they have the mechanical aptitude required in these trades.

Most communities require plumbers to be licensed. To obtain a license, workers must pass an examination to demonstrate knowledge of the trade and of local plumbing codes.

Some plumbers and pipefitters may become supervisors for mechanical and plumbing contractors. Others go into business for themselves. As they expand their activities, they may employ other workers and become contractors.

Job Outlook

Employment of plumbers and pipefitters is expected to grow as fast as the average for all occupations through the mid-1990's. Over the long run, construction and renovation of powerplants, pipelines, office buildings, factories, and other projects that have large, complex pipe systems are expected to spur the demand for pipefitters. Residential construction also is expected to increase the demand for plumbers.

In addition to jobs created by increased demand for plumbers and pipefitters, many openings will occur each year from the need to replace experienced workers who retire, die, or stop working for other reasons. Relatively few plumbers and pipefitters transfer to other occupations, reflecting their lengthy investment in training. Nevertheless, most job openings will stem from replacement needs.

Because of the temporary nature of construction projects, plumbers and pipefitters may become unemployed for short periods when the project on which they are working ends. Some plumbers and pipefitters may face longer periods of unemployment when overall construction activity declines and fewer jobs are available. Employment of these workers, however, generally is less sensitive to changes in economic conditions than many other construction trades. Maintenance of existing piping systems provides jobs for many plumbers and pipefitters even when construction activity declines.

People wishing to enter plumbing and pipefitting apprenticeships are likely to face competition. High wages and opportunities for all-round training attract many people to these programs.

Earnings

Median weekly earnings for plumbers and pipefitters who are not self-employed were $405 in 1984. Most earned between $295 and $585 weekly. The lowest 10 percent earned less than $225; the highest 10 percent earned over $741.

In 1984, hourly wage rates for plumbers and pipefitters in metropolitan areas were about $13.50. In comparison, the average wage for all nonsupervisory and production workers in private industry, except farming, was $8.33. Apprentice wage rates start at 40 to 50 percent of the rate paid to experienced plumbers or pipefitters and increase every 6 months.

Many plumbers and pipefitters are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada. Some plumbers and pipefitters who have become contractors are members of the Associated Builders and Contractors, the Mechanical Contractors Association of America, and the National Association of Plumbing-Heating-Cooling Contractors.

Related Occupations

Other occupations in which workers install and repair mechanical systems in buildings are boilermakers, electricians, elevator constructors, environmental control system installers and servicers, hot air furnace installers and repairers, millwrights, oil burner servicers and installers, and sheet-metal workers.

Sources of Additional Information

For information about apprenticeships or work opportunities in plumbing and pipefitting, contact local plumbing, heating, and air-conditioning contractors; a local chapter of the Mechanical Contractors Association; a local of the union mentioned above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of plumbers, pipefitters, and sprinklerfitters, contact:

National Association of Plumbing-Heating-Cooling Contractors, 180 S. Washington St., Falls Church, Va. 22046.

Associated Builders and Contractors, 729 15th St. NW., Washington, D.C. 20005.

National Fire Sprinkler Association, P.O. Box 1000, Patterson, N.Y. 12563.

Mechanical Contractors Association of America, 5410 Grosvenor Lane, Suite 120, Bethesda, Md. 20814.

EMPLOYMENT PROJECTIONS: CONSTRUCTION CRAFTWORKERS

NOTE: ***It must be borne in mind that the 35,000(?) U.A. members are largely employed in selected major industry groups such as new commercial and industrial buildings, electrical and other utility facilities, institutional facilities (e.g., education, hospital, etc.), and maintenance and repair construction. It is noteworthy that the average annual rates of change (measured by dollar output) of these particular types of construction are about four times higher than residential and other types of construction. (See Table __.) Therefore, the projected construction employment rate of change for plumbers and pipefitters reported below may be under-stated for the U.A. potential proportion. (See Tentative Computed Future Manpower Needs for Plumbers and Pipefitters in the next section.)***

* * * * * * *

Many factors went into the econometric model which projected that the total U.S. workforce would grow about 19 percent between 1986 and the year 2000.

Construction trades and extractive workers. Employment for carpenters is projected to grow by about 18 percent, or by 182,000 jobs -- the largest numerical increase among occupations in this cluster. Close to one-third of the gain is expected to occur among self-employed carpenters. The residential building and nonresidential carpentering and flooring industries are expected to add the bulk of the remaining jobs.

Employment in the electricians occupation is projected to grow by 89,000 jobs. Most of the increase is expected to occur in construction, which will more than offset job losses projected for electricians in manufacturing.

Employment for painters and paperhangers (construction and maintenance) is projected to increase by 90,000 jobs. More than 40 percent of this increase is expected among self-employed painters and paperhangers. The wage and salary worker increase is projected to occur in the construction, real estate, and services sectors.

The BLS study projected that the total number of plumbers and pipefitters would grow from about 402,000 to 471,000 -- an increase of 17 percent during this same period. (During past years there have been somewhat parallel relationships between total population, the workforce, and the proportion of plumbers and pipefitters.) In order to meet this projected growth of about 69,000 pipetradesmen about 4,900 new pipetradesmen will be needed each year. In addition, due mostly to death and retirement, more than 12,000 more will be needed ... making up a total of about 17,000 annually. (Separation rates applied were 2.88% in 1986 increasing to 2.96% by 1990.)

SELECTED U.S. CONSTRUCTION CRAFTWORKERS (1986-2000)

Occupation	Employment (in 1,000's) 1986	2000*	% Change 1986 to 2000
Total, All Occupations	111,623	133,030	19%
Construction & Extractive Wkrs	4,006	4,710	18%
Bricklayers	161	187	16%
Carpenters	1,010	1,192	18%
Electricians	556	644	16%
Oil & Gas Extraction Workers	108	110	2%
Painters, Constr. & Maint.	412	502	22%
Pipelayers & Pipelaying Fitters	52	59	15%
Plumbers & Pipefitters	402	471	17%
Roofers	142	181	28%
Structural & Reinforce Metal Wkrs	86	104	20%

* Uses moderate growth trend for the U.S. economy.

Source: Monthly Labor Review, Sept. 1987. U.S. Dept. of Labor, Bureau of Labor Statistics.

Most construction workers are White and men. In 1986, there were 7.29 million construction workers, of which 6.68 million were White (92%) and 6.67 million were men (91.4%). Moreover, Non-White construction workers tended to be older than White construction workers, suggesting that a smaller proportion of Minorities are entering construction occupations than are Whites. A smaller proportion of Minority women also enter construction occupations than do White women.

AGE DISTRIBUTION OF EMPLOYED CONSTRUCTION WORKERS BY RACE: 1986

(numbers in thousands)

TOTAL, ALL RACES

AGE GROUP	TOTAL Number	TOTAL Ethnic Percent	TOTAL Age Percent	WHITE Number	WHITE Ethnic Percent	WHITE Age Percent	BLACK Number	BLACK Ethnic Percent	BLACK Age Percent	OTHER Number	OTHER Ethnic Percent	OTHER Age Percent
TOTAL, 16 & OVER	**7,288**	**100.0%**	**100.0%**	**6,681**	**100.0%**	**91.7%**	**497**	**100.0%**	**6.8%**	**110**	**100.0%**	**1.5%**
16 - 19 years	321	4.4%	100.0%	306	4.6%	95.3%	12	2.4%	3.7%	3	2.7%	.9%
20 - 24 years	1,049	14.4%	100.0%	978	14.6%	93.2%	58	11.7%	5.5%	13	11.8%	1.2%
25 - 54 years	5,142	70.6%	100.0%	4,698	70.3%	91.4%	361	72.6%	7.0%	83	75.5%	1.6%
55 yrs & over	775	10.6%	100.0%	700	10.5%	90.3%	65	13.1%	9.7%	10	9.1%	1.3%

WHITE

AGE GROUP	TOTAL Number	TOTAL Gender Percent	TOTAL Age Percent	MEN Number	MEN Gender Percent	MEN Age Percent	WOMEN Number	WOMEN Gender Percent	WOMEN Age Percent
TOTAL, 16 & OVER	**6,681**	**100.0%**	**100.0%**	**6,087**	**100.0%**	**91.1%**	**594**	**100.0%**	**8.9%**
16 - 19 years	306	4.5%	100.0%	285	4.7%	93.1%	21	3.5%	6.9%
20 - 24 years	978	14.5%	100.0%	901	14.8%	92.1%	77	13.0%	7.9%
25 - 54 years	4,698	70.3%	100.0%	4,265	70.1%	90.8%	433	72.9%	9.2%
55 yrs & over	700	10.6%	100.0%	636	10.4%	91.9%	64	10.8%	9.1%

About 91 percent of the White workers were men and 70 percent were between the ages of 25 and 54 years. White women tended to be slightly older than men.

BLACK

AGE GROUP	TOTAL Number	TOTAL Gender Percent	TOTAL Age Percent	MEN Number	MEN Gender Percent	MEN Age Percent	WOMEN Number	WOMEN Gender Percent	WOMEN Age Percent
TOTAL, 16 & OVER	**497**	**100.0%**	**100.0%**	**476**	**100.0%**	**95.8%**	**21**	**100.0%**	**4.2%**
16 - 19 years	12	2.4%	100.0%	12	2.5%	100.0%	--	--	--
20 - 24 years	58	11.7%	100.0%	55	11.6%	94.8%	3	14.3%	5.2%
25 - 54 years	361	72.6%	100.0%	344	72.3%	95.3%	17	81.0%	4.7%
55 yrs & over	65	13.1%	100.0%	63	13.2%	96.9%	2	9.5%	3.1%

Nearly 96 percent of the Black workers were men with notably smaller proportions in the younger age groups (<24 yrs) than Whites. Black women in construction tended to be older than Black men -- as well as White women.

SOURCE: Valerie A. Personick, Office of Economic Growth and Employment Projections, U.S. Department of Labor, Bureau of Labor Statistics, 441 "G" Street, N.W., Washington, D.C. 20212.

CAUSES OF DECLINING EFFECTIVENESS *

One major reason that construction is comparatively inefficient is its inordinate fragmentation. ... [T]oo much of the industry remains tethered to the past, partly by inertia and partly by historic divisions -- management vs. labor, unions vs. open shop, business vs. government, sometimes one union vs. another or one contractor association vs. another. ... Needed are -- more careful planning, improved communications, more effective supervision, more thoughtful personnel and manpower policies. More than half the time wasted during construction is attributable to poor management practices. A great many of the proposals are aimed at executives of companies that commission the building of industrial facilities, commercial structures and power plants -- the owners. ... [T]he study teams conclude, that if owners who pay the bills are willing to take extra pains and pay the often small extra cost of more sensible methods will they reap the benefit of more construction for their dollars.

A Hope For Some Help From The Unions

There are problems in the role played by organized labor. Among them are the recurrent strife and job delays engendered by jurisdictional disputes among the AFL-CIO Building Trades' 15 unions about which is entitled to do certain jobs. But the main thrust of the findings and recommendations is to call on organized labor to act in its own job-creating interest by increasing productivity. By some estimates, open shop construction accounted for 60% of the national total in 1980, compared with only 30% as recently as 1973. In a recent analysis of data supplied by the Labor Department's Bureau of Labor Statistics, the Washington-based Construction Labor Research Council, a private organization supported by a number of contractor associations, reported that the number of craftsmen identifying themselves as union members had declined by 125,000 from 1973 to about 1.6 million in May 1980, while those identifying themselves as non-union workers had risen by 400,000 to nearly 3 million.

... The economic pressure of this historic shift should by now have prompted building trades unions to take vigorous steps to regain jobs for their members, especially by relieving union contracts of handicaps that are making them less competitive than open shop rivals. There have been some encouraging cases in which union leaders have restored management flexibilities through national and/or project agreements, and have avoided costly work stoppages and inflationary wage settlements. Occasionally, local unions have agreed to remove restrictive language from local contracts. But in most local unions where union contractors still have enough work to provide jobs for the outspoken minority of members who influence local union policies, business as usual appears to prevail. ... [T]here are some signs of changing attitudes. In half a dozen cities voluntary local labor-management groups have had success at reducing jurisdictional strikes, improving productivity on unionized projects and thereby making their communities more attractive places in which to build. This appears to be a promising route for future progress. **The study teams make no overall endorsement of open shop contracting, concluding that a vigorous construction industry requires its union sector, with its experienced and capable contractors and pool of skilled workers.** Moreover, the study teams meticulously point out that many open shop contractors do not appear to manage their labor force as adroitly as they might, with a corresponding loss of potential productivity. The reports do stress the idea that the nation's interest will best be served by fair economic competition between open shop and unionized construction.

There is a clear need for leaders of the building trades unions to cooperate in ridding construction of cost-boosting practices and habits that, whatever their historic justification, make little sense in today's altered economic climate. Happily, there are indications that a number of top union leaders are receptive to these and some other proposals from the CICE study teams. **For example, the late Martin J. Ward, then general president of the United Association of Plumbers and Pipefitters, advocated mergers to reduce the number of building trades unions from the present 15 to roughly four or five -- a step that at least theoretically would obviate a great deal of jurisdictional struggle. In an interview late in 1981 with** Engineering News Record, **Ward observed: "The greatest challenge that the building trades have is the number of unions." No major changes, Ward stated appear imminent. Still, in the meantime, Ward continued doing what he could inside the plumber's union by spurring moves to merge local unions; the total number has been reduced by more than 100 (about 20%) over the past decade. As he saw it, such consolidations benefit both rank-and-file tradesmen and contractors. The latter have fewer hiring halls with which to deal, and a larger pool of craftsmen from which to draw; they also can pay identical wages and fringe benefits across a larger geographical area. Tradesmen, Ward noted, escape "false barriers" of local jurisdictional boundaries, an arrangement that sometimes has left craftsmen, who have worked steadily for years, without enough time in any one local to acquire vested pension rights....**

J.C. Turner, general president of the International Union of Operating Engineers, agreed that consolidation among the international building trades unions is a good idea. ... And he added that building unions "are willing to do our share in a cooperative venture to improve productivity. ... We are well aware that the standard of living of our members rises and falls with the profits of our employer." A decade ago, even talk about such cooperation with management was all too seldom heard.

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* More Construction for the Money (Summary Report of the Construction Industry Cost Effectiveness Project). -- A Study -- The Business Roundtable, January 1983. (Boldface added)

APPRENTICESHIP ISSUES AIRED DURING BCTD LEGISLATIVE RALLY

Problems confronting union apprentice and training programs were aired at a workshop held during the AFL-CIO Building and Construction Trade Department's annual legislative conference held April 10-14.

Workshop speakers said the greatest number of apprentices in federally registered training programs come from the building trade unions but the number of apprentices in these programs has been shrinking in recent years, a reflection of the continued decline of the union sector of the construction industry.

A representative of the AFL-CIO Human Resource Development Institute said union training programs in general "are shrinking because our market share is shrinking." He told building trade delegates that "more thought should be given to expanding the market for our services."

John Van Erden, director of the Department of Labor's Bureau of Apprenticeship and Training, reminded delegates of the prominence of building trade training programs. Construction accounts for well over half of all registered apprentices...

Van Erden was asked why BAT-certified open shop or "unilateral" training programs that have low completion rates are continued. He said BAT rules are "very general," that the bureau has virtually no enforcement authority...

'Train At Every Level'

Allyn Parmenter, director of training for the United Association, urged unions to "train at every level" and stressed the need to provide journeyman up-grade training as well as training new journeymen. He reminded delegates that bringing new permanent members into the union keeps established benefit programs operating.

The UA operates 488 apprentice programs, owns 350 training schools in the U.S. and Canada, and spends about $50 million a year on training. Parmenter said the UA had to buy most of its schools because union programs had become "second class citizens" to vocational education programs.

According to Parmenter, 60 to 70 percent of registered apprentices are in the building trades. "The great thing about building trade apprentice programs is that a trainee can work during the day, go to school in the evening to get answers to problems that arose during the day, and then take those answers to the job site the next day," he said. Parmenter expressed a concern common to all crafts, that of a shrinking market for union labor services.

With fewer union jobs available in construction, the UA has fewer apprentices, he said. It also takes longer for some apprentices to meet their minimum hours of work requirement before journeyman status can be conferred. "You have to have jobs to have apprentices," Parmenter pointed out. "Ten years ago, we had 40 applications for one apprentice slot."

Parmenter said more public relations work needs to be done to draw attention to the quality of union training programs. "It is time to tell the public about what training goes on in the building trades.

Parmenter pointed out that joint union training programs are paid for by employers and employees in the construction industry, not with public money. Hourly employer contributions to the UA's national pension fund average about 13 cents an hour, he said.

Training For A Career

Robert Krul, director of training for the Roofers, said unions apprentice programs, unlike those in the open shop, train people "for a career", not "to use them as cheap labor and then dump them."

Krul was infuriated with what he considers unrealistically high federal goals imposed on unions for bringing women into the construction trades and refuted claims that unions are anti-women. Krul stressed that his union welcomes women to the craft who are willing and able to take on the "physical intensity" of roofing work. "We have women working in our craft by their choice, not the government's," Krul said.

Ken Edwards, director of training for IBEW, said building trade unions represent only 13 percent of all registered training programs but 68 percent of all registered apprentices. As reported by other crafts, Edwards said IBEW is losing apprentices because of a shrinking union sector in construction and corporate restructuring in other industries in which IBEW members work. According to Edwards, "There is a role for BAT in safeguarding the role of training programs."

For a career "to be meaningful," Edwards said, "it can't be learned in 2,000 hours or at no cost." He chided the Associated Builders and Contractors, an organization that represents open shop contractors, for spending less than $500,000 on training during the same period and substantiated his claim by passing out copies of recent ABC internal financial reports.

NEW OFCCP DIRECTOR CHARTS COURSE FOR IMPROVING AGENCY'S OPERATIONS

After years of criticism directed at its failure to police federal contractors' affirmative action efforts, there is a "renewed commitment to a strong enforcement code" within the Labor Department's Office of Federal Contract Compliance Programs, according to Jerry Blakemore, the agency's new director.

Now that the U.S. Supreme Court has resolved "uncertainties about the validity" of affirmative action plans, attention at OFCCP can be focused on such areas as training personnel, decentralizing the agency's management system, and rewriting the OFCCP compliance manual, Blakemore said in a BNA interview. The OFCCP director also is putting into place new methods of ensuring that contractors are making efforts to place women and minorities in high-level corporate positions...

SAFETY ISSUES

Safety concerns, particularly compliance with the Occupational Safety and Health Administration's expanded hazard communication standard and substance abuse at the jobsite, highlighted the American Subcontractors Association's March 22-27 annual meeting.

ASA has been critical of OSHA for giving the construction industry only about nine months to comply with the expanded hazard communication standard since the manufacturing sector had about two and one-half years to gear up for compliance.

ASA passed a resolution to ensure that its 7,000 members are kept informed about the hazard communication standard and that changes would be sought for any conditions of the standard that the association considered "overly burdensome" to its members.

Mike O'Brien, assistant director of Government Relations for ASA, said, "It will require every construction employer, and even small businesses, to list every hazardous substance on the job. So if you have an electrical subcontractor on the site next to the construction people, he will have to list hazardous substances he is working with and inform all the other workers there," he said.

Imminent Deadline

Under the expanded hazard communication standard issued by OSHA, construction employers have until May 23 to develop a "hazard communication program" to guide their employees on the handling of and protection against hazardous substances on the job (33 CLR 1148, 12/9/87; 33 CLR 732, 8/26/87). ...

ASA has joined other construction industry associations in a federal court suit asking for a delay of the effective date of compliance with the hazard communication standards (33 CLR 1391, 2/24/88).

ASA also has joined other construction associations in issuing a brochure called "Countdown to Compliance," which lists various steps employers should take to identify hazardous substances on the worksite and promote employee awareness of these substances.

Substance Abuse

The ASA Safety Committee announced results of a survey that found substance abuse at the jobsite to be a serious problem.

The committee sent out 500 questionnaires and received 125 responses. Seventy-six percent of those answering the survey said substance abuse was either a serious or extremely serious problem in the industry.

Alcohol was cited by 85 percent of the respondents as the most-abused substance while 30 percent said it was marijuana. Cocaine was listed by 10 percent of the respondents.

Interestingly, when asked about substance abuse in their own companies, only 23 percent of the respondents said it was a serious problem, while a substantial majority, 80 percent, said it was not very serious or no problem at all (total exceeds 100 percent due to rounding). Seventy percent of the respondents said the percentage of substance abusers in their own companies ranged from none to under 10 percent, while 11 percent said more than a fifth of their employees were abusers.

Expensive Habits

The survey asked employers to rank areas where substance abuse has led to increased costs. Fifty-eight percent of the respondents cited overall construction costs, 33 percent listed workers' compensation costs, and 30 percent said health care costs.

Ranking problems caused by substance abuse, respondents cited reduced productivity (74 percent), absenteeism (71 percent), late starts (59 percent), early quits (34 percent), turnover (33 percent), employee theft (30 percent), accidents (29 percent), and injuries (22 percent).

The majority of employers responding to the survey said they have a company policy to deal with substance abuse in the workplace (58 percent). Others said they deal with the problem through supervisory training (18 percent), internal employee assistance programs, health promotion, and search and seizures (10 percent each).

Construction Labor Report
0010-6836/88/$00.50

APPRENTICESHIP CONFERENCE RESOLVES TO PROMOTE UNION TRAINING PROGRAMS *

... [D]uring the Aug. 16-22 National Apprenticeship Conference ... [a]mong the resolutions adopted were policy positions in the following areas:

• Alert the President and Congress to the immediate need to cease the "present trend of erosion of the longstanding and proven standards of apprenticeship." Conference participants were concerned about the "continuous and relentless efforts" to dilute training programs "by approving sub-standard parallel programs," an apparent reference to "unilateral" open shop training programs....

• Seek government funding for an independent, private foundation study of apprenticeship as a method of training "essential to preparing the workforce for the year 2000 and beyond and helping the U.S. to meet global economic competitive challenges."...

Future of Apprenticeship

... [A]pprenticeship administrators must make their programs better known to the public so the programs can be used as a tool to enhance U.S. international competitiveness....

[M]ore minorities and women should be brought into training programs. Most new entrants into the workforce will be minorities and women....

Kenneth R. Edwards, national training director for IBEW, said it has become increasingly difficult to find qualified applicants for union training programs. Although the applicants have high school diplomas, many of them have such large academic deficiencies that the union has to provide remedial education just to start them in training courses.

Edwards said IBEW construction apprentice enrollment was down to about 1,600 this year, from about 2,500 several years ago.

'Unparalleled' Way to Train

Apprenticeship is an "unparalleled way to train workers," Raymond Marshall, Secretary of Labor in the Carter Administration, said. "In the past, people have seen the apprenticeship system as an exclusive system, and all workers did not need to be in the system," Marshall ... said.

"That type of attitude is obsolete because our standing in the international marketplace is dependent on having a skilled workforce," he said.

Marshall also observed that apprenticeship's success depends on continuing the voluntary cooperation among unions, management, and the government. "If the system were left to just one of these groups, it would probably fail," he said....

"Minorities and women are the workforce of the future, and it is in the best interest of the apprenticeship system and the country to see that skills are provided to these groups," ... [I]t is not only good public policy ..., but it will be necessary for the survival of the system.

Training Enrollment Trends

As of June 30, there were 236,900 registered apprentices in all apprentice programs, according to data from BAT. These figures do not include approximately 50,000 trainees in military programs. ... [A]gency officials estimated that about 50 percent of these apprentices are in construction programs....

Philosophical Question

... Reese Hammond, director of education and training for the International Union of Operating Engineers, blasted the trend toward multicraft apprenticeship instruction and fragmentation being promoted by certain organizations to circumvent established apprenticeship programs. ... The purpose of FCA is to promote broad-based, highly skilled training programs. ... [A]pprentice programs should emphasize a credentials approach. The concept of earning while learning may be a revolutionary concept for the rich, "but for us little people, it's our only chance," he said.

... Carmel Morris, vice president of All-state Electrical Contractors Inc. of Jacksonville, Fla., said "apprenticeship is not just for the chosen ones, it is for everyone and anyone who qualifies." ... [M]aintenance of strict apprentice-to-journeyman ratios on the jobsite "has closed the doors" of apprenticeship opportunity in the construction industry for many people. The average age of a journeyman carpenter in Florida is 68, he said.

* Selected news, Construction Labor Report, August 26, 1987, pp. 740-741.

TRAINING MAKES THE DIFFERENCE *

There's one final and compelling reason why your apprenticeship training is so important to you and your industry. That's our competition with non-union or open-shop contractors and mechanics.

Open shops are tough competition. They claim to "work cheap." They can best be countered by the cooperation of our entire industry -- our union, our employers, and each and every apprentice and journeymen. The marketplace will determine whether we succeed -- those who use piping trades services will decide to buy (or not to buy) our services.

This is where you and your apprenticeship training come in. We say that our industry's training programs make a real difference. We say that trained union pipe tradesmen are more knowledgeable ... have better skills ... work faster and with less supervision ... do the job better ... and are more effective because they do the job right the first time.

These statements are true. Our industry has proven them again and again, over many decades.

But our customers keep asking the ultimate question, "What have you done for me lately?" We must keep proving that we are the cost-effective choice. We must make it happen. Our industry's future -- and your future -- depends on it. To compete effectively, you must make the most of your opportunities as an apprentice.

* Extracted from the NJS-PAC Publication for Apprentices, Your Heritage and Future in the Pipe Trades, Jan. 1985.

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CONFERENCE CELEBRATES 50 YEARS OF TRAINING UNDER FITZGERALD ACT *

Robert A. Georgine, president of the AFL-CIO Building and Construction Trades Department, called jointly funded and administered training programs in the construction industry "the most successful system for training in the world."

The national apprentice training program to date has made a substantial contribution to strength and growth of the U.S. economy, but Georgine expressed concern about the future....

Without naming the open shop or non-union sector of the industry, Georgine said "groups" that operate "unilateral" training programs that exclude organized labor have done so for the purpose of creating a pool of cheap labor, exploiting workers, and "making a sham of the apprentice system."...

Management Perspective

William G. Bell, senior vice president for the Bechtel Group Inc., credited the national apprenticeship program with being able to "continuously upgrade and strengthen" the U.S. workforce with "an infusion of newly-trained talent."...

Skilled labor shortages predicted by the late 1990s, if not sooner, will be brought on by fewer young people entering the workforce, aging of the workforce, and changes in retirement patterns.

Citing data from the Bureau of Apprenticeship and Training, Bell said the number of registered apprentices peaked in 1979 at 324,000. Since that time, he said there has been a steady decline in enrollment in apprentice programs so that by the middle of this year, only 237,000 trainees were enrolled, a drop of nearly 27 percent since 1979.

Bell predicted a strong demand for infrastructure and electric utility facilities in the 1990s, work that will require large numbers of skilled building tradesmen. "If we don't step up the number and quality of our training programs now, we won't be prepared to meet that demand," Bell said....

Bell's suggestions for improving apprentice programs included having some of the curriculum "geared to management issues." ... "We need to teach apprentices to view themselves as key members of a competitive team, not just as members of the Auto Workers, Carpenters, or Iron Workers."

Training programs could include courses that promote a greater understanding of "competitiveness and management programs," ... to give trainees "a clear idea of how they impact productivity" and "what it takes for them and their employer to remain competitive" in the face of growing global competition.

Portability of apprentices should be seriously considered. ... Union policies often restrict apprentices from traveling from one part of the country to the other, causing surpluses and shortages in labor. "Only by establishing a uniform portability policy will we be able to successfully meet demand throughout the country and increase opportunities for apprentices," he said.

* Selected news, Construction Labor Report, August 19, 1987, Vol.33, pp.702-703.

STATE APPRENTICESHIP COUNCILS TOLD TO BE OBJECTIVE IN REVIEWING PROGRAMS *

The Department of Labor has directed its state apprenticeship councils (SACs) to approve "all eligible apprenticeship sponsors on an objective basis without regard to whether they are joint or unilateral programs."

Through their "past actions," the department said, some SACs "may be dangerously near not fulfilling their obligations as required by federal regulations." In general, apprenticeship staff members have been reminded to "continue their emphasis on promoting and encouraging apprenticeship sponsors to consider performance-based apprenticeship training."

ABC Petition

ABC asked the department to re-examine its policies and rules and petitioned the department for a number of changes in federal training regulations that would "provide qualified programs the opportunity to train workers and begin to meet the critical demand for skilled labor facing the construction industry."

ABC explained that construction training programs "emphasizing task training or shortened apprenticeship periods operating unilaterally or outside the collective bargaining arena often do not receive the necessary approval from the department-recognized State Apprenticeship Councils (SACs), while they meet the federal Bureau of Apprenticeship and Training (BAT) criteria (ABC's emphasis)."

ABC stressed its position that the department "must structure its procedures to permit approval of all programs meeting appropriate criteria, regardless of their sponsorship."

Non-union training programs, sometimes referred to as "unilateral" programs because they are contractor-administered and paid for, have been developed at the national level by ABC and the Associated General Contractors. Both programs had difficulty getting Labor Department approval and are operating on a smaller scale than union apprentice training programs.

* Selected news, Construction Labor Report, August 26, 1987, pp. 740-741.

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OPEN-SHOP CONSTRUCTION TRAINING PROBLEMS *

... Most of ABC programs are geared to commercial and light industrial work with little training for heavy industrial work. ... [W]here these programs have been established within the framework of a formal apprenticeship program, the number of classroom and on the job training hours is consistent with the government requirements. ... Most programs take three to four years to complete, similar to their counterparts in the union sector. Those programs that differ in the required number of hours (classroom and job site) generally do not have BAT or SAC approval.

Training is conducted through utilization of the facilities of vocational schools, high schools, junior colleges, universities, as well as contractor's shops, and leased or rented facilities. Trainees generally attend classes four hours weekly on their own time without pay.

Programs as a whole have had good success in recruiting large numbers of applicants, but as is the case in union apprenticeship programs, a large percentage fail to complete the program ... A major problem appears to be apathy on the part of the contractors. ... In all too many cases, contractors feel that their need for trained manpower is met by hiring additional qualified manpower from a competitor as the need arises.

The research showed that less than one-third of the association member contractors participate in the training programs even where they are available. Six reasons for this contractor non-participation in training programs are:

1. Fear of losing a bid due to added training costs.
2. Fear of training employees and losing them to a competitor.
3. Fear of working with a non-proven program.
4. Failure to recognize a need for training, since workers can be pirated from their competitors.
5. Lack of employee acceptance of traditional training programs.
6. Lack of appreciation of the improved productivity that can be realized through training of their workers....

In 1979, the ABC initiated an ambitious program, to extend through 1986, aimed at developing training curricula in 21 separate construction trades. This program, a project of the Merit Shop Foundation, and known as the Wheels of

* Training Problems in Open Shop Construction, (Report D-41), The Business Roundtable, Sept. 1982.

Learning is being implemented through contracts with several midwestern universities to develop appropriate instructional modules for the different trades. These modules are then field tested by a number of contractors to ensure their applicability to current construction practice and problems....

CONCLUSIONS

- The fragmentation existing within the construction industry tends to reduce the effectiveness of most training programs within the industry.
- Many open shop contractors do not recognize the improved productivity that can be realized through the training of their workers.
- There is a need for a continuing effort toward a well developed curriculum of construction craft training programs for use by open shop contractors, particularly in the specialty trades, and adapted to the needs of industrial construction.
- Greater emphasis should be placed on development of task oriented curriculum.
- There is essentially no understanding on the part of owners as to how craft training takes place within the construction industry or how it is funded.

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Challenges and Opportunities

THE NEED TO TRAIN MORE BUILDING TRADESMEN *

Efforts by owners, contractors, and unions to improve the productivity of the U.S. construction industry will be impeded until the workers who put up the buildings and their supervisors are better trained. But how best to train workers and their supervisors remains a riddle....

There is little disagreement among management and labor representatives in the industry about the shortage of skilled workers and that steps must be taken to deal with the problem before it gets worse. ... [M]ost of the workers who will determine how effectively U.S. industry deals with global competition already are in the workforce....

Construction is feeling the heat of [foreign competitions] ... as Japanese successfully enter the U.S. construction market, and overseas markets for construction no longer are dominated by U.S. builders.

Tax Credits for Training?

... "The tax act last year killed R&D in construction. If you think additional money for R&D [for training] is coming out of the construction industry, you're dreaming."

In Defense of Construction

"I know you don't want to hear this," Richard Tucker, director of the Construction Industry Institute, said, "but the construction industry is one of the most efficient major industries, considering what we do." Tucker was not suggesting that no more could be done to improve construction productivity.

... A CII study of owners found only 36 percent were even aware of -- let alone used -- recommendations for improving cost effectiveness in the industry made by the Business Roundtable's Construction Industry Cost Effectiveness (CICE) Program. And that was after more than 1.5 million copies of the recommendations were distributed free by the Roundtable....

Supervisor Training Focus

... [O]wners consider training "a very serious problem" in the construction industry. Supervisory training is seen by owners as "the single most important step to improve productivity on the job site."...

... [However,] "the biggest problem is the [contractor]." Builders resist training their workers because they view it as a cost.... [C]ontractor associations "have not done a good job getting the point across" to members about the long-term importance of training workers.

... Unless training programs for tradesmen expand, a severe shortfall is expected. ... [T]he average age of a construction worker today is 47.8 years.

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* "Need to Train More Building Tradesmen Aired Before Management, Labor Panels," Construction Labor Report (Special Report), April 29, 1987, Vol. 33, pp. 247-250.

Emerging Prominence for Training

... [E]mployment and training policies "are quickly becoming a major part of economic and business planning." The ability of the U.S. economy to compete "externally and internally" is directly related to training....

Current data ... suggest ... that the workers coming into the workforce are not trained to step into jobs available now and, as a group, will be incapable of bringing in new skilled people to fill jobs.

Future Is Now

... [T]he Port Authority of New York-New Jersey ... found that a "significant portion of the population" is not working and that major industry is "starting to move out because of its inability to attract a capable workforce." ... "Those two issues in a microcosm are what will happen on a national level during the next 20 to 30 years and will be a problem facing employers across the country."

Meeting Business Needs

... The burden on state and federal agencies "is to ensure that training programs are useful to business and not to the bureaucratic interests they have served so far."

... The array of training programs in place today is "an absolute bafflement to local businessmen." ... They do not know whether to "deal with a vocational education program, or JTPA, workers' adjustment, welfare, or whoever."

... [C]onstruction training programs will have to produce skilled workers more quickly. ... "[T]raditional training programs," an apparent reference to most union apprentice programs, will have to switch from time to competency bases to get needed workers into the job market faster. "We don't have time to invest in long-term, slow-growth traditional training programs any more." ... In the ideal world, Jones said training in construction "becomes a life-long process."...

Building Trades' Experience

Union representatives ... discussed the rationale for extending apprentice programs in several crafts from four to five years, at a time when open shop and government training experts are pushing for competency-based training.

... [T]he level of education of applicants to IBEW training programs has been so poor that the union needs the first year of a program "to bring apprentices up to speed academically."...

Enforcing Hiring Hall Procedures

There [is] ... the need to enforce hiring hall journeyman-apprentice ratios among signatory employers and perhaps bring enforcement of those provisions under an agreement's grievance procedure. ... [However,] enforcing journeymen-apprentice ratios "will be a problem." ...

Employers appear to prefer a smaller crew composed of skilled workers only over a mixed crew of journeymen and apprentices. ... Contractors would rather get the job done more quickly with a smaller crew of journeymen than have a larger crew of skilled workers and trainees take longer to get the job done for the same labor costs. ... [Furthermore,] local union business representatives have to deal with unemployed journeymen who "get teed off" when apprentices get referred for employment ahead of them. This places unions in a bind ... because "we carry the burden of training a skilled workforce."...

The Case for Time-Based Programs.

... The initial appeal of competency-based programs is strong. ... In such a program, a worker is trained to perform a specific task, tested shortly after this instruction, passes the test, and moves on quickly to the next task to be learned. As long as a worker is called upon by an employer to perform only a few specialized tasks, this approach works well....

But on a typical construction site, ... a worker must draw from a wide range of skills, be able to integrate them, and use judgment that only experience can provide to determine which combination of skills is best to get the work done properly in the shortest amount of time. A time-based program gets a worker out on many jobs over the course of a four- or five-year period, ... and it gives that worker the depth of experience needed to be a journeyman and a true master of his craft.

POINTS TO PONDER

In "Major Industrial Research Unit Studies No. 62", a chapter was devoted to Training and Development. The 'Conclusion' is reported below for discussion purposes as it bears directly on manpower planning and training for skilled craftsmen in the construction industry.*

Challenges and Opportunities

CONCLUSION

Open shop contractors utilize on-the-job training as their primary training tool, but the extent of formal training has expanded, and there is evidence that it will continue to do so. It is now generally recognized that many union craftsmen learn their trades informally, despite that sector's much longer experience with widely organized apprenticeship programs. There will undoubtedly always be a place for the specialist who performs a simple, repetitive task which can be learned rather quickly by observation, as well as the journeyman who is less than an all-around craftsman but can do most jobs. ... [A]s open shop contractors compete for an ever larger share of the union market; as they challenge the union contractor for the larger jobs requiring sophisticated methods and coordination of complex activities; and as more union contractors opt for open shop or "doublebreasted" operations, the need for structured training forms becomes increasingly apparent. Multimillion and multibillion dollar projects are not built entirely either by specialists or by first-class craftsmen.

In another sense, of course, the open shop contractor is even more dependent on training than his unionized counterpart. He does not have access to a pool of labor which can often be augmented by a telephone call from a business agent to outlying communities. Although open shop contractors can and do cooperate by lending and trading workers, this process lacks the central brokerage agent which unions supply. Open shop hiring halls or referral agencies are still in their formative stage. Thus, for the open shop contractor, a training program, which can issue a steady flow of competent craftsmen, is the most reliable source of skilled labor, and the largest open shop contractors recognize this fact.

It can be said with some confidence that investment in formal training by open shop contractors will, in large measure, be a function of their employer organizations. Except for the giants of the industry, these contractors are, for the most part, small even by the standards of the atomistic construction industry. The underwriting of a modern training program can be prohibitively expensive for the individual contractor, especially with the danger that the trained worker will leave to take a job elsewhere. By pooling his resources with others similarly situated, he can benefit from the economies of scale associated with most undertakings....

The dominant form of training and development in the open shop sector remains on-the-job training, but off-the-job formal instruction is becoming widespread and increasing. ... [T]he significance of the helper and of on-the-job training are not properly credited in a Business Roundtable report. Nevertheless, the Business Roundtable deserves enormous credit for highlighting the need for more open shop training. As a result of its efforts, the ABC and other organizations have formed the National Open Shop Training Trust. In turn, these associations have asked the large users that are members of the Business Roundtable to finance the trust so that training can be underwritten. Since these same users contribute substantially to union-management training programs whenever they engage a union contractor, open shop associations maintain that they are only requesting parity treatment. The future of open shop training is thus dependent upon the users as well as upon open shop associations and contractors....

Regardless of the success of the training trust, open shop training seems certain to expand. The needs of the contractors require this. In particular, the expansion of the open shop in the higher skilled trades ensure it. The result will not only be more training, but more effective training as well, based upon task instead of time requirements and geared to the needs of construction now and in the future, rather than upon either artificial journeyman-apprentice ratios or the use of apprentice trainees to do work that a helper might better perform while learning on the job.

[Related extract from The Business Roundtable Study]

Open shop contractors are also often smaller than their unionized counterparts. Such companies are unlikely to be able to afford the cost of formal training, but often do a considerable amount of informal instruction. It is impossible to measure, but equally impossible to ignore. This does not mean that on-the-job and formal training are equivalent. As most of the employers whom we interviewed acknowledged, the manipulative skills developed on the production line are more easily and more quickly inculcated in the trainee who has had some theoretical exposure to the fundamentals and his trade and to the materials, implements, and methods of construction generally. There is, however, need for several types of training, including both formal and on-the-job training.

* Source: "Open Shop Construction Revisited", by H.P. Northrup, University of Pennsylvania, The Wharton School, Industrial Research Unit.

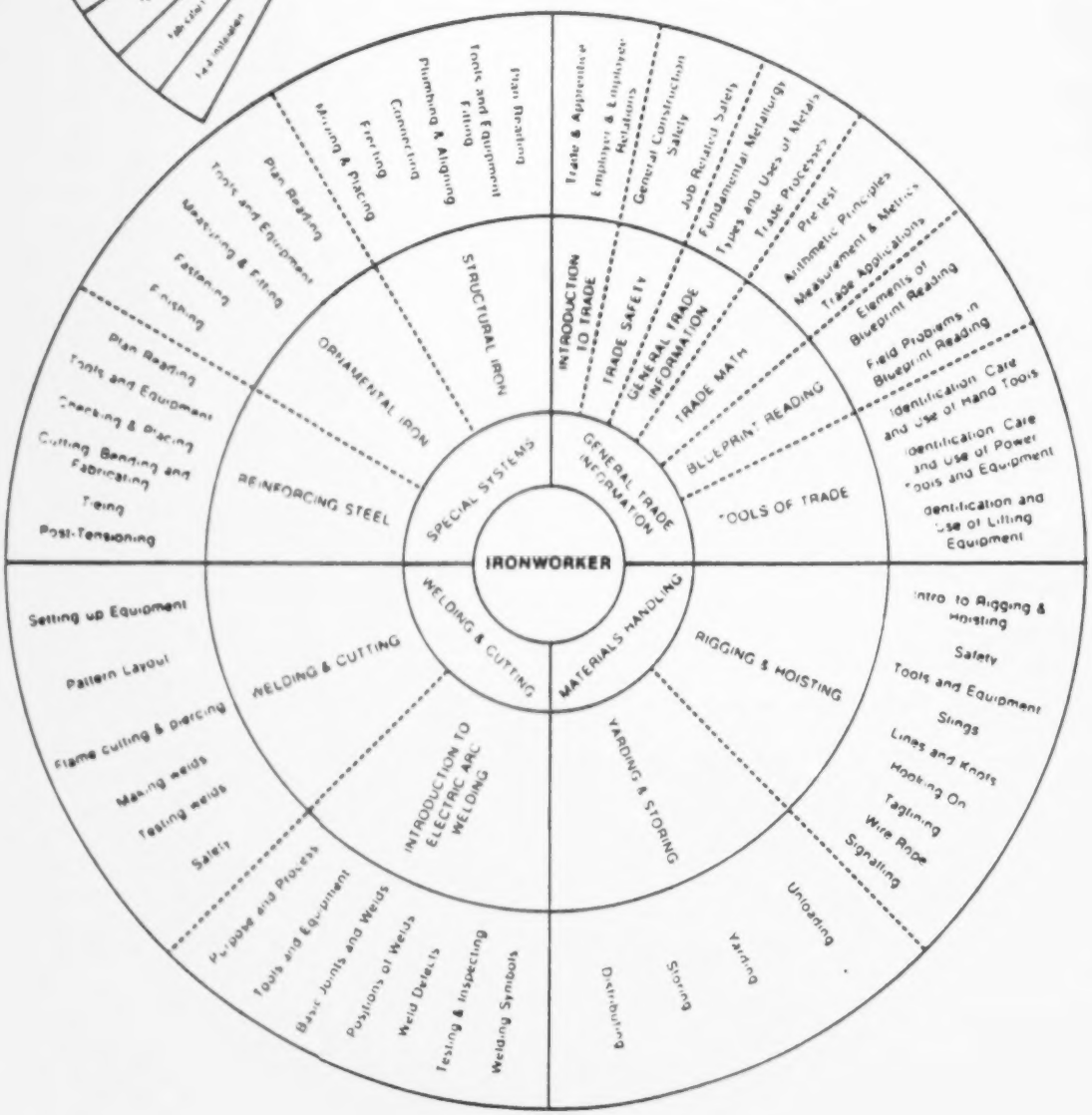
Curriculum Options

Creating a Multiskilled Craftworker

OR

Formal Apprenticeship

All the tasks within a craft can be used as the curriculum for a formal apprenticeship program.



VI SUPPLY AND DEMAND INFORMATION *

NOTE: This extract of a study is presented to provide a basis for review and discussion designed to improve U.A. manpower and training planning, operations, and employment situations.

J. P. Lisack

I

STUDY SUMMARY

(Selected Highlights)

Surveys among construction users and contractors indicate that they need and use construction labor supply information in planning construction projects. They also indicate a need for labor demand information in order to estimate that portion of supply available for their projects. [Labor unions also need supply and demand information. J.P.L.] Currently, users and contractors rely on local sources for the supply-and-demand information that they use. These local sources include chambers of commerce, contractors' associations, local unions, local managements, etc. [The U.A. locals,Regional and National offices can use accurate supply-and-demand information to facilitate planning and operations designed guide training and to assure full employment of members. J.P.L.]

Although users and contractors make little use of published federal and state government supply-and-demand information, they would consider using it if they understood it and had confidence in its accuracy.

Weighing the survey findings, the study team remains somewhat skeptical as to how much contractors and construction users would use improved supply-and-demand information if it were developed. They are primarily interested in spotting future labor shortages so that they can develop strategies to overcome them on their projects.

While many sources of labor supply-and-demand information were investigated, the team's work concentrated on government sources because of the consistency and regularity of data collection and publication. Moreover, most users and contractors are well acquainted with the informal local sources.

The Occupational Employment System (OES), a joint program of states and the Bureau of Labor Statistics (BLS), appears to have the greatest potential for providing the desired supply data. Only California and New Hampshire do not participate in this effort. Participating states collect employment data by construction-craft occupation and by component of the construction industry. Part of this data is sent to the BLS for aggregation into national numbers which appear in regular BLS reports. States also publish reports of their own giving greater detail. A significant residue of data is not published at all. Unfortunately, formats used by BLS and by states in publishing this data do not facilitate its use by users or contractors. However, the study team feels, based on the contacts made, that states probably would be willing to consider providing data in more useful formats.

As for labor demand information, both the Department of Labor and states provide data. The Labor Department does so through its Construction Labor Demand System (CLDS), a management information system which is designed to provide data matching that of the OES program. The accuracy and value of the system depends upon the quality and quantity of its input. The team feels the input should be improved. States also publish projections of demand. However, formats vary, and the completeness of input is questionable.

Considering all this, we recommend that a two-phase pilot program be developed to see whether improved supply data can be provided by a test state and whether that data would actually be used by users and contractors for construction planning. [Unions must be an integral part of any supply and demand system. J.P.L.]

If this pilot program is successful, the team recommends that other states be asked to provide similar supply data. At the same time, the team recommends that attention be given to improving input to the Labor Department's Construction Labor Demand System to provide better labor demand information.

If all the proposed steps prove successful, users and contractors would gain access to substantially improved labor supply-and demand information for construction planning throughout the U.S. [This must run the entire spectrum, from the local on up and back. J.P.L.]

It should be pointed out that both federal and state systems mentioned in this report may be affected by federal budget cuts imposed during the present administration. All research for this study was conducted prior to such cuts.

* Source: "Labor Supply Information; A Construction Industry Cost Effectiveness Task Force Report D-5". April 1982, Reprinted July 1987. The Business Roundtable.

II

[Reason for the Study]

Accurate information about the supply of skilled craftsmen for major construction projects is difficult to obtain. As a result, it is difficult to predict what impact a proposed project will have on an area and equally difficult to predict whether the project will be completed in a timely manner.... [Of importance to the U.A., of course, is to predict accurately what this skilled manpower demands will be. J.P.L.]

III

INTRODUCTION

The supply of construction labor in a given area is usually not a primary factor in choosing a site for an industrial facility. Yet it becomes of major importance prior to and throughout construction.

Historically, construction users and contractors have paid less attention to the availability of manpower during construction planning than they have when faced with a crisis during construction involving recruiting enough qualified craftsmen to complete the project on time. In the past, numerous attempts have been made to solve such problems by expensively and unproductively placing project on an overtime basis to attract and retain craftsmen.

Labor supply involves quantity and quality, both of which are influenced by demand. In times of general labor surplus, such as in a recession, employers have little or no difficulty in obtaining enough workers with sufficient skills. There are, of course, exceptions, among them construction in a remote area, or in areas where a major project overshadows other construction work. Shortages may also occur in crafts that require a high degree of specialization and skill.

In times of high economic activity many employers face labor shortages, particularly of skilled craftsmen. If should be noted, however, that demand often generates supply. When jobs are available, more persons may enter the labor market or re-enter after having ceased looking for work when job opportunities are scarce. But even job availability may not be sufficient. Additional inducements may be required.

Filling jobs when demand is increasing is relatively easy if the work to be done is unskilled or semi-skilled. New workers can be trained quickly on the job. Open shop construction contractors take advantage of this situation because of their freedom to organize their work so as to use individual employees on a wide variety of tasks. Union contractors, on the other hand, are constrained by collective bargaining agreements which specify the use of journeymen for certain work and which limit the number (or ratio) of apprentices or subjourneymen who may be employed. Until union contractors can establish a work force that to some extent union contractors and open shop contractors are looking at different sources for their manpower.

Broadly, the supply of workers for the local construction industry comes from seven sources, some of which may overlap:

- Those already employed in the industry (both union and non-union).
- Unemployed construction workers.
- Workers employed at other jobs, who are waiting for construction employment.
- Persons enrolled in apprentice training programs.
- Persons enrolled in vocational training programs.
- Other new entrants.

Supply must not only meet demand, but must also replace those leaving the market because of retirement, death or other reasons.... [Sufficient "lead-time" must be anticipated so that the numbers of appropriate apprentices and journeymen will reasonably parallel the demand needs. J.P.L.]

Data on the number of workers formerly employed and awaiting a return to construction jobs are not available. But, a ballpark estimate of the potential number can be derived by comparing monthly employment figures for the past year or two with the number currently employed....

There is no readily available, systematic source of statistical data on travelers -- the migrant skilled labor of construction.

The Labor Department's Bureau of Apprenticeship and Training (BAT) provides, on request, computer runs of apprentice enrollment and graduates, by craft by state. But the data usually are not available until about a year and a half after the fact (i.e., 1981 data becomes available only in July 1983).

To obtain the numbers of persons enrolled in vocational training programs and state vocational training programs, one must inquire of state vocational education administrators and schools.

"Other new entrants" are apt to consist largely of unskilled, untrained workers employable as subjourneymen, helpers or trainees. In many cases, it is unnecessary to have an estimate of the number of potential workers of this type because demand often generates an ample supply.

IV

FINDINGS

What Users and Contractors Want to Know About Labor Supply

Several discussions were held with construction users about labor supply information used in their construction planning. They indicated that supply information, without demand data, was not useful. Their current sources of information included local users groups, chambers of commerce, local contractor associations, local managements, etc. Users indicated that the information they normally want is for a state or a standard metropolitan statistical area (SMSA).

Construction users divide areas of interest into two types: those where they have existing operations, and those where they don't. Where users have an operation, they feel they have a fairly good source of information in their own local management. If they do not have operations in a projected site area, they make surveys to project manpower supply.

They want to know the number of available craftsmen by trade for industrial construction. Users indicated that they rarely try to get data for every craft, but concentrate on such key trades as pipefitters, electricians, boilermakers, carpenters and operating engineers. Users indicated that, if possible, they would prefer to have these numbers broken down by how many are union members and how many are not. They were somewhat skeptical as to whether this could be achieved. Since users wish to know the available supply to them, this requires a forecast of concurrent labor demand for other projects. Some local user groups, notably in the Gulf Coast area, not only conduct surveys of manpower involved in industrial construction and contract maintenance but also project future demand. This labor supply information has been helpful to construction users planning Gulf Coast projects. [underline added]

Users need data as much as three years in advance of construction to enable them to devise contracting strategy. Numbers at this point, need not be as precise as they need to be later. About one year before the projected start of construction, users attempt to fine-tune this data for bid evaluation.

In sum, the users sampled for this study do obtain and use construction labor supply-and-demand information. None reported using regularly published government information for this purpose. [underline added]

Several major industrial contractors were asked what sources they traditionally use to obtain data about the availability of craftsmen. Among the sources mentioned were local union, local contractor associations, chambers of commerce, state employment agencies, representatives of minority groups, vocational schools, industrial commissions, and government sources. The contractors interviewed said that there is usually no problem in a given area in securing enough brick-layers, cement masons, laborers, millwrights, operating engineers, pile drivers, painters, carpenters, roofers, sheet metal workers, or teamsters. Crafts that are apt to be in short supply, according to the contractors sampled, and where it may be necessary to recruit, train or otherwise qualify manpower, area asbestos workers, boilermakers, electricians, iron workers and pipefitters.... [underline added]

Contractors expressed concern that the days of the "boomer" -- the nomadic journeyman willing to go anywhere where the pay is enticing -- are coming to a close. Most construction craftsmen now seem to have roots in one locality. They have also developed alternative vocations, and are increasingly reluctant to travel beyond normal commuting distances. This change strongly reinforces the need for improved manpower planning. [underline added]

Perhaps unsurprisingly, contractors say it would be very helpful to have manpower availability projected by craft and by calendar quarter for two to three years in the future and compiled by states or, in larger states, by local areas within the state. Additional information such as the number of available travelers, turnover, and the types of specialities available -- such as welders -- would be useful. [underline added]

Published Labor Supply Information

Federal Sources: The Bureau of Labor Statistics publishes two types of employment figures. One is based on "establishment surveys" -- that is, data collected from a very large sample of business organizations (e.g., construction contractors) in a cooperative arrangement with state employment agencies. Data are published for total employment (employees only) and for production workers (construction workers in the construction industry, a definition that includes all employees up through working-foreman level). The estimates are adjusted once a year to jibe with "benchmark" employment figures derived from unemployment insurance reports filed with state employment agencies.

"Household surveys," the other type, are monthly samples of households throughout the U.S. Published employment figure are for "all persons employed"; that is, they include proprietors, partners and unpaid family workers as well as employees....

The Labor Department's Bureau of Apprenticeship and Training, (BAT), publishes a statistical report on apprenticeship activity each calendar year, based on data from the state-national apprentice reporting system (SNAPS). The report shows, for each craft: the number of apprentices added, the number who cancelled and the number who completed the programs during the year; as of year-end, the number of apprentices in the program and number of minorities, females and veterans.[1] As a labor supply component, apprenticeship completions should be considered, even though they represent only a small portion of total supply.

The Census Bureau issues several publications that deal with labor supply, including, ***Characteristics of the Population*** (based on the decennial census) and the ***Census of Construction Industries***, but the data provided are not timely. The team believes other information described in this report will be more useful to both users and contractors.

State Sources: A federal-state cooperative program called Occupational Employment Statistics (OES) is designed to produce national, state and area data by occupation and by industry group. The survey is conducted periodically by mail by state employment services or agencies. Forth-eight states and the District of Columbia participate. Only California and New Hampshire do not. The survey is conducted over a three-year cycle (manufacturing industries one year, nonmanufacturing except trade industries the second year, and trade industries the third year).

Extensive lists of occupational titles are used in these surveys. For that reason, one who uses this information must be conversant with craft (e.g., carpenter) subdividions in order to aggregate them (e.g., lather, dry wall applicator, taper, etc.) for the craft....

Graduates of vocational-technical construction trade programs are generally not comparable to graduates of registered apprenticeship programs, but they are a source of construction workers. Figures on present enrollment and recent graduates by specific program and school are available from state departments of vocational-technical education.[4]

Private Sources: Several private sources provide labor-supply data. The Construction Labor Research Council (CLRC), a statistical research organization supported by seven national contractor associations, makes information available to users and contractors on a subscription basis. The CLRC collects and maintains a data base of union construction wage and fringe information, as well as manpower information, for use in improving construction-industry collective bargaining. Data come from local contractor chapters and associations. In addition to occasional reports, subscribers may obtain some labor supply information for specific areas of the country from CLRC.[5]

Published Labor Demand Information

Federal Sources: The Labor Department's Construction Labor Demand System (CLDS) is a management information system designed to provide forecasts of the volume, type and regional location of construction activity, as well as the associated on-site labor requirement by crafts. The data matches that of the joint state-federal occupational employment statistics, using the same occupational grouping and the same construction industry subdivisions. Separate forecasts are made for each state. Information about labor demand reaches CLDS from both private and government sources....

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[1] To obtain this data, write U.S. Dept. of Labor, Bureau of Apprenticeship and Training, Washington, D.C. 20213.

[4] A quarterly directory of state personnel responsible for vocational education is published by the U.S. Office of Education, Div. of State Vocational Programs, Bldg ROB3, RM 5640, Seventh and D Sts., Washington, D.C. 20202.

[5] Address: Construction Labor Research Council, Suite 200, 2033 K Street, NW, Washington, D.C. 20006.

To supplement short range data for long range demand estimates, CLDS uses a detailed econometric forecasting model of long range construction activity. The model uses different methods for energy and non-energy construction. The construction period for each project is divided into ten deciles. Labor requirements for each craft are estimated separately for each decile. Labor divisions are important because labor needs for any one construction trade vary during a project as different stages of construction ensue. The statistical data for the conversion comes from BLS surveys, CLDS engineering studies and surveys, and Bechtel's energy-supply planning model.

CLDS output is available in work hours, work quarters (520 hours), or work years (2080 hours) of labor requirements for each craft. The requirements are assigned to the counties or state where the construction occurs.

The study team has reservations about the completeness of CLDS information on current short term labor demand, especially for industrial non-energy construction. However, CLDS is a potentially sound concept for ultimately supplying users and contractors with labor demand forecasts for future planning. [underline added]

State Sources: Most states publish projected labor demand for many occupations, including construction crafts. Most of these forecast occupational demand for three years in the future. Although only a few systems were studied, the team's impression is that none has enough data to provide quality projections. [underline added]

Private Sources: As noted earlier, users and contractors indicated they were acquainted with and used local sources of labor demand information, including chambers of commerce, contractor associations, local user groups, etc. Accordingly, such information is not covered in this report.

V

CONCLUSIONS

Labor Supply Information

The study team recommends use of BLS "establishment" data because it is collected and published for local areas. Interested parties should get in touch with officials of state employment services to see what is available for a given area. State publications vary and no published catalogue of available state publications is known to exist.

In the federal-state joint program for Occupational Employment Statistics (OES), the study team feels that the list of occupational titles is too complex and can only be made useful by aggregating sub sets into principal crafts. On the other hand, the construction industry classifications seem quite satisfactory. [underline added]

Labor Demand Information

The study team feels that the Construction Labor Demand System (CLDS) has the potential for being useful to the construction industry. On the plus side, CLDS provides matching data to OES. However, CLDS forecasts are only as good as the input is current, accurate and complete. As of now, we have reservations about the input. Effort is needed to improve this deficiency.... [underline added]

NOTE: A review and discussion of a U.A. Manpower and Training Network Concept follows. J.P.L.

SOME KEY MANPOWER AND TRAINING HIGHLIGHTS OF THE UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE PLUMBING AND PIPE FITTING INDUSTRY - 1988 U.S.A. AND CANADA *

★ There are 487 sponsored training programs.⊙

★ There are 46,000 apprentices in training.⊙

★ Individual programs are run locally by the Joint Apprenticeship and Training Committee consisting of representatives from the U.A. local and the local contractors.

★ The Apprenticeship Program is coordinated nationally by joint United Association and contractor committees.

★ There are 324,000 active U.A. members in the U.S. and Canada.

Notes:

- Numbers of apprentices to be trained are determined locally by the Joint Apprenticeship Committee.
- A general monitoring network of pipe tradesmen supply and demand is maintained by the International Office. Essentially, this system is based on reported information concerning where substantial needs exist (or are forecast) and where there may be a surplus of workers.
- The United Association construction industry apprentice program is considered by many to be the best in North America.

⊙ *These numbers exceed the U.S. Bureau of Apprenticeship and Training reports. (See Section V, pages 34 & 35.)*

Source: *United Association, Training Department.*

SOME TENTATIVE COMPUTED FUTURE MANPOWER NEEDS FOR PLUMBERS AND PIPEFITTERS

Perspective:

Putting employment of plumbers and pipefitters in a broad perspective, the U.S. Department of Labor has determined that in 1986 there was a total of about 402,000 persons employed in the construction industry (all applicable occupations and levels of skills); employment was projected to expand to about 471,000 (an 18% increase) by the year 2000. This is within one percent of the anticipated total workforce increase (19%) during this same period. However, as stated a number of times earlier, the employment of U.A. members tend to be in the following types of construction: new commercial and industrial buildings, new electrical and other utility facilities, new institutional facilities (e.g., education, hospital, etc.), and maintenance and repair construction. Importantly, the projected annual rates of change (measured by dollar output) of these selected types of construction are much higher than the rates projected for residential, farm, and other types. Therefore, the U.A. contingent must be computed separately. It is important to note that many non-union pipetradesmen also work in these faster-growing types of construction.

Projected needs for total pipetradesmen in all types of construction.

In order for the growth (to the year 2000) of some 69,000 additional plumbers and pipefitters employed in all types of construction to occur, an input of some 4,900 new ones will be needed each year. An additional 156,000 will be needed during this period due to separations (i.e., attrition due to deaths and retirements), which amounts to about 11,100 per year. (The annual separation rates applied are 2.88% increasing to 2.96% by the year 1990 and beyond.) The total requirement to meet both growth and attrition thus becomes about 16,000 new entrants per year. ... Of course, these pipetradesmen come from all sources (ranging from individuals in self-trained OJT through formal Union apprenticeship programs). This type of calculation is not nearly specific enough to help in U.A. manpower and training planning, which is reviewed in the next paragraphs.

Projected Needs for U.A. Planning: USA and Canada

USA: Again, the basis for future planning is spongy ground; however, a broad estimate of the U.A. segment can be derived. First, assuming a U.A. active membership in the U.S. of 290,000 and a projected growth of 17 percent for plumbers and pipefitters to the year 2000, results in a total growth possibility of 49,775 U.A. plumbers and pipefitters (nearly 3,555 per year). Separations, computed on annual attrition rates of 2.88 percent increasing to 2.96 percent by 1990, result in an estimated total loss of about 112,535 to the year 2000 (8,035 per year). The total needs for growth and separation to the year 2000 thusly became 162,310 which will average out to about 11,590 per year. If the U.A. can produce that number of new members annually the Association will probably maintain its present share (keep pace) with the anticipated construction industry growth in the applicable types of construction. However, as reported in the previous paragraph, the future total annual needs for some 16,000 plumbers and pipefitters make the potential market for U.A. members so large, the above U.A. calculations represent a minimum goal. The key to the U.A. portion of the trained pipetrades manpower requirements is basically how cost-effective employers view them to be. The destiny of the U.A. is in the hands of every apprentice, journeyman, instructor and official in the Association.

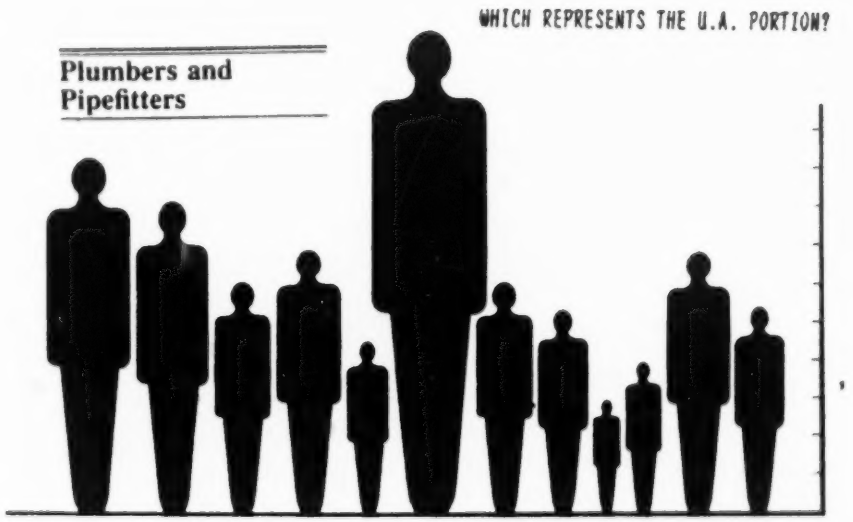
Total USA and CANADA: According to U.A. headquarters, as of early 1988, there are 324,000 active U.A. members in the U.S. and Canada. This membership and the previous growth and separation rates (for the U.S.) lead to total needs for growth and separation for the U.S. and Canada combined to the year 2000 of approximately 181,340 new members, or 12,950 per year. Note that this estimate compares favorably to the current count of 46,000 U.A. apprentices in training.

Three other key considerations pertain:

1. Gross estimates of total quantitative needs computed for the U.A., in the final analysis, must be the sum of the regional/local requirements. (These, of course, are not constant, and reflected in the significant shifts in population and the locals of large jobs in appropriate types of construction.)

2. The necessity to apply new technology and organizational structure and operations designed to increase efficiency (e.g., provide skilled workers where and when needed, raise productivity, improve quality and lower costs). Journeymen and apprentices must always be aware of the need to be a step or more ahead of the competition.

3. Notwithstanding the above growth and attrition computations (largely presented for illustrative purposes), the U.A. might consider deriving projected needs estimates from the locals on up. Such efforts would necessarily have to be based on common definitions, guidelines and procedures, which should involve local contractors as well.



A Discussion Guide and Worksheet #1

TECHNOLOGICAL ADVANCES CONSIDERATIONS

- New Materials: Examples

(1) Polymers/plastics instead of cast-iron and other metals.

(2) New adhesives and joining devices instead of standard threads/couplings/fittings. (e.g., Victaulic couplings replacing some welding; plastic bonding...)

(3) Changes in materials (e.g., no lead solder for drinking-water pipe joints and units).

(4)

- New systems and multiple combinations:

(1) More electronics: less hydraulics & pneumatics.

(2) More combinations and over-lap of mech/elec, etc. (e.g., heat-pump systems).

(3) New/improved instrumentation and controls. (e.g., digital read-out)

(4)

- New tools and accessories

(1) Use of lasers. (e.g., ceiling/wall/piping alignments, ditch-digging control...)

(2) Computers (e.g., on-site scheduling and control...)

(3)

(4)

CHALLENGES AND OPPORTUNITIES

A Discussion Guide and Worksheet #2

CHANGES AND ISSUES AFFECTING MANPOWER & TRAINING

What to do to meet them successfully, and on time?

- Construction technology is advancing.

- Need to work harmoniously (all workers-contractors/owners), necessity for crew teamwork, competition is a major consideration for contractor/owner, and worker. Competition is local, regional and becoming world-wide (e.g., Japanese are lobbying to bring in their own construction workers).

- Competition from non-union/open-shop contractors and mechanics, (e.g., Teamsters vertically integrated, tailored team concept).

- "Compete locally -- think globally". Anticipate and beat the competition.

- Need to meet job needs; provide "crew" with mixed skills and trades to meet contractors'/job needs. (Tailored -- put card in your shoe?)

- Jurisdictional matters? How to square with crew operations and changing needs.

- Some people are needed with higher special skills; some with "multi-skills"; some with lesser skills. Some needed short term, some longer term. Double-breast?

- Shift from NEW construction to more retrofit, up-fit, renovation, modification/modernization, expansion, and heavy maintenance.

- More maintenance and repair of complex, (integrated) systems.

- National-level agreements for consistency vs. local autonomy and control.

- Training concept and program differences: Competency [test-out] based training -- job and specializations (training wheels); Time-based training (broad-complete trade-career); Job needs, availability and cost.

- Stabilization Agreements (SASME): pay supplement between jobs, job placement assistance, reimbursement for travel to new work sites.... Costs?

- Apprentice Agreements (e.g., training cost refund if worker 'jumps ship'...)

KEY: U.A. members *must* provide the best cost-effective choice.
The ultimate question: *How do we do it?*

A Discussion Guide and Worksheet #3

SOME OTHER CONTEMPORARY ISSUES

Challenges and Opportunities

- How to determine current and future skilled manpower needs. Must be met quantitatively and qualitatively. Much construction and maintenance work is there ... how does U.A. become the most cost-effective choice?
  - What is average age of a journeyman pipe-tradesman?
  - What is plan to accommodate a smaller, younger, and more diverse workforce entering the market? An open window?

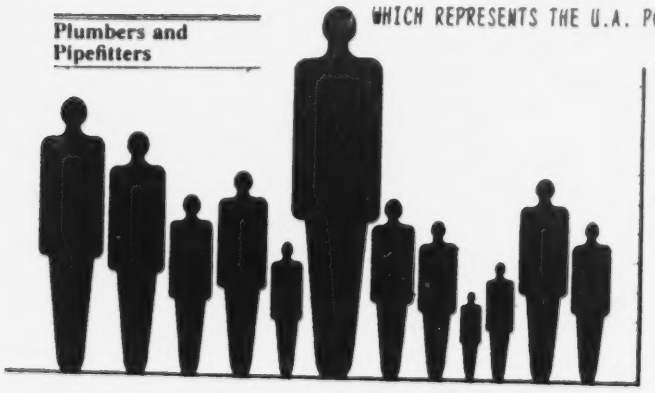
- How to train required numbers and levels of skilled workers (best ways --)
  How to get sufficient numbers of qualified apprentice applicants?
  How to keep journeymen up-dated? Image?

- Should construction industry handle it's own training needs?
  If so, how? Union/Contractor-Owner/Vocational Training...
  What about costs, controls, standards, coordination?

- Federal Government providing training (esp. for unemployed and "at-risk" groups)?

- How to gauge the economic effect on the U.A. and construction industry if manpower goals are not met?

- What about substance abuse, and the "scarcity" of women and minorities in construction trades?



NETWORKING: A CONCEPT

Needed: A Central Brokerage Agent, Joint Operations.

CONSIDERATIONS:

- Contractors' needs for workers. Numbers of workers by specific trades, specialties, skill level, experience, times and locations.

- Workers' needs: knowledge about

  (1) What jobs matching their skills and experience are available, when and where?

  (2) Transportation, housing and essential facilities or other support.

  (3) Special training/prep., experience needed? Training available?

- Management, Control & Information System -- Beyond a local pool of workers which can be augmented by a telephone call from a business agent to outlying communities; and in more detail than large number supply/demand info.

  (1) Data bank, kept current, containing key information bits. Titles, definitions, procedures needed. Initial usage planning should go hand-in-hand with creation of data bank and types of info contained.

  (2) Linkages (coordinated communications) integrating all parties at all levels.

  (3) Operations and access controls (coordinated); scheduling and usage planning.

  (4) Cost considerations (all participants?)

* * * * * * *

Point of discussion on skilled manpower "shortages":
Is this more a matter of mobility than availability?

* * * * * * *

Consider this approach --

Implementation: Phase I - Pilot - One State
to develop a model -- and see if contractors will use it.

Phase II

If YES, Evaluate, Revise -- expand then go National ... (International?)

If NO, Evaluate -- See if alternative concepts or approaches are feasible